

**Technical Manual**

**NAVY TYPE ACB**

**640 FRAME SIZE**

**AIR CIRCUIT BREAKER**

**WESTINGHOUSE TYPE DBN-40S**

**DIRECT-CURRENT**

**BUS-TIE AND FEEDER SERVICE**

**(SS576 and SS577)**

WESTINGHOUSE REFERENCES

GENERAL ORDER HR-44957-Y  
CUSTOMER'S ORDER 31790  
BREAKER SHOP ORDERS (SEE PAGE 4)  
SWGR. T.M. S.O. 32-Y-9858

CONTRACTS NObs-3599 AND N102S-59375

TECHNICAL MANUAL 35-224-C7

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# AIR CIRCUIT BREAKER

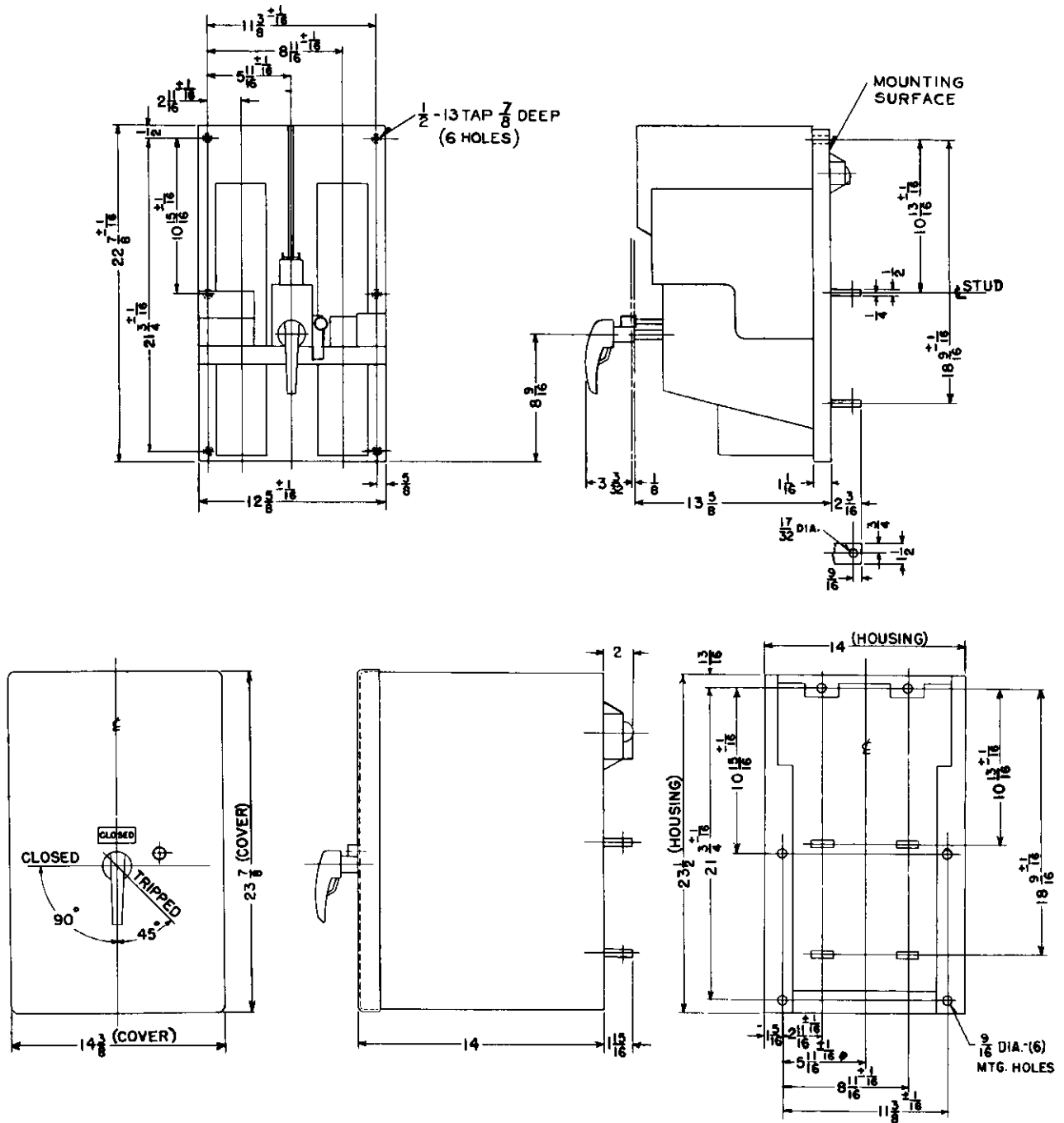


FIG. 1 — Air Circuit Breaker — Outline Dimensions  
(Dwg. 300-C-258-1)

# NAVY TYPE ACB CIRCUIT BREAKER

## Westinghouse DBN-40S (Modified)

### (BUS-TIE AND FEEDER)

## SECTION A—INTRODUCTION

### A-1. LIST OF ILLUSTRATIONS AND REFERENCE DRAWINGS

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### A-2. CIRCUIT BREAKER DIMENSION PLAN (FIG. 1)

Fig. 1 gives the outline dimensions for the Navy Type ACB, 640-Frame-Size, Air Circuit Breaker; Westinghouse Electric Corporation Type DBN-40S, Direct-Current Breaker, in enclosure.

**SECTION B—GENERAL DESCRIPTION**

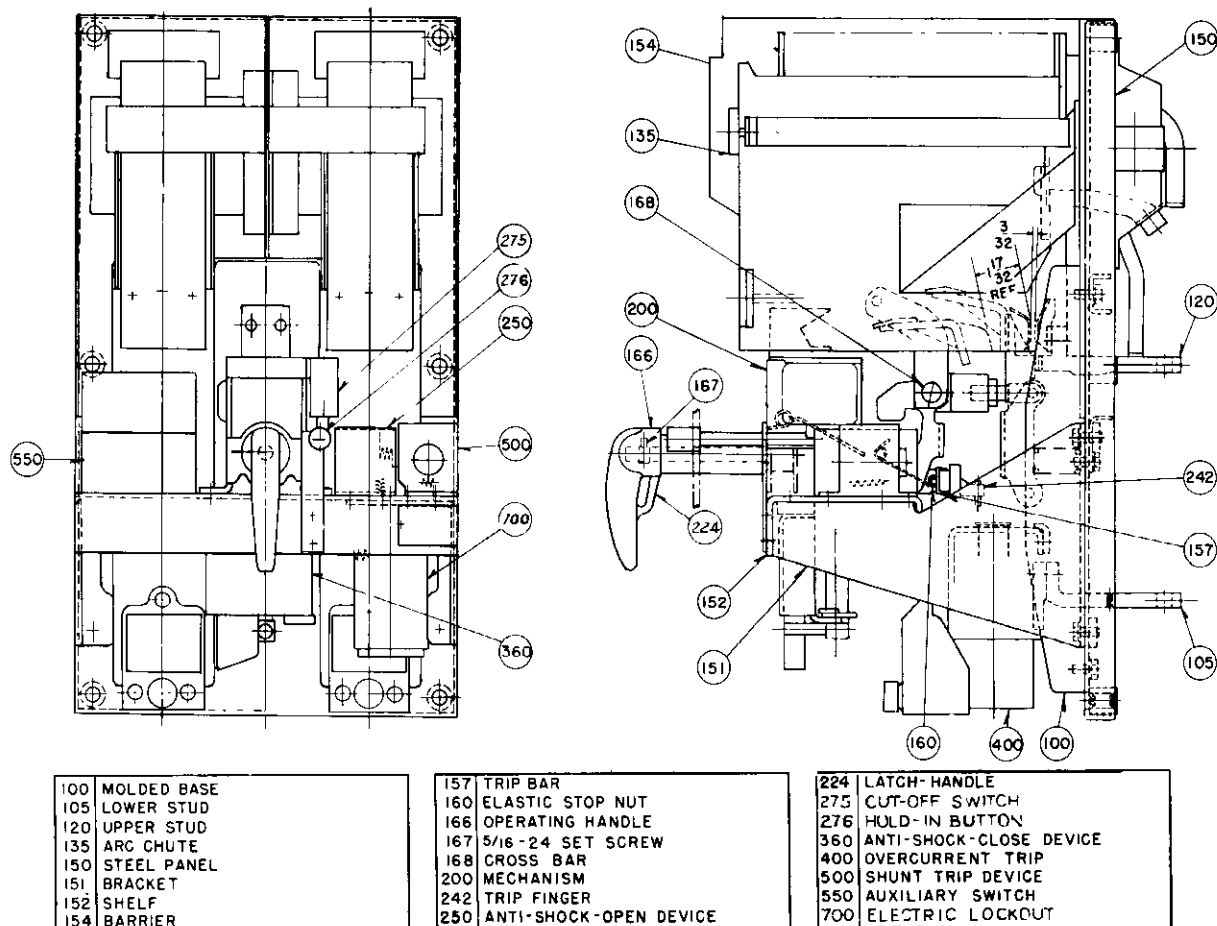


FIG. 2 — Air Circuit Breaker — General Assembly  
(Dwg. 445-D-043-1)

**B-1. IDENTIFICATION DATA**

A) The circuit breakers described in this book are the bus-tie and feeder breakers for the SS576 and SS577. The identifying "Shop Orders" (which appear in the breaker nameplates) and the applicable "Certification Data" are as follows:

CERTIFICATION DATA			
Westinghouse Shop Order	Application	Westinghouse Drawing No.	Hull No.
32-Y-9857	Bus Tie	33-B-6496	SS 576
32-Y-9858	Feeder	33-B-6497	SS 576
33-Y-1764	Feeder	33-B-6498	SS 576
33-Y-1765	Feeder	33-B-6499	SS 576
33-Y-1766	Bus Tie	33-B-6526	SS 577
33-Y-1767	Feeder	33-B-6527	SS 577
33-Y-1768	Feeder	33-B-6528	SS 577
33-Y-1769	Feeder	33-B-6529	SS 577

**B-2. GENERAL**

A) The Type "DBN-40S" is a modified 640-frame Type ACB Air Circuit Breaker as appears on Westinghouse Master Drawing 1-JH-448, BuShips Drawing S6205-H-3198878, and as modified by applicable "Certification Data".

**B-3. CONSTRUCTION**

A) The chassis of the air circuit breaker consists of a rigid steel panel '150', Fig. 2, on the front of which is bolted a supporting frame consisting of a bracket '151', which in turn supports shelf '152'. A separate pole unit '100', is bolted to the steel panel for each pole. The base of each pole unit is molded from insulating material. When supplied, the series-overcurrent-trip devices '400', are bolted to the lower part of the pole-unit base. The moving contact assembly is pivoted at its lower end on the pole-unit base and is connected to the lower stud

35-224-C7

either directly or through a series-overcurrent-trip device. The stationary contact assembly is connected directly to the upper stud. The moving contact assembly opens and closes the electric circuit by moving out and in from the stationary contact assembly. An arc chute is mounted above and surrounding each pair of contacts. Its purpose is to stretch and cool the arc drawn when the contacts separate so that it may be readily extinguished.

**B)** The operating mechanism '200', is located on the breaker shelf '152', and transmits the force for closing the breaker from the operating handle '166', to the cross bar '168', and thence to the moving contact assembly through insulating links. The mechanism then latches and holds the contacts in the closed position. The circuit breaker is closed manually by releasing latch '224', operating handle '166', and then turning the operating handle '166', 90° clockwise. It may be tripped manually by turn-

ing the handle 45° in the opposite direction. Automatic tripping is accomplished by one of the automatic devices which lift the trip bar when suitably energized. These devices consist of the shunt trip '500', and the series-overcurrent trip '400'. One or more auxiliary switches '550', and a terminal block are supplied depending on the number of control and auxiliary circuits to be controlled by the operation of the circuit breaker.

**C)** The main power circuit through the circuit breaker consists of the lower stud, series-overcurrent-trip coil (if supplied), shunt, moving contact assembly, stationary contact, and upper stud, all connected in series in the order named.

### **B-4. MOUNTING**

**A)** Type DBN-40S circuit breakers are supplied in individual enclosures, see Fig. 1.

## SECTION C—OPERATION AND MAINTENANCE

### C-1. CAUTION

Before working on a circuit breaker, the load and control circuits feeding it must be de-energized. The breaker should be in the "OPEN" position, but it should be noted that all circuit breaker studs are not necessarily "dead" when the circuit breaker is open.

Before putting the circuit breaker in regular operation it should be closed and tripped manually several times to see whether all parts are in proper alignment and move freely. Particular care should be taken to make sure the studs have not been forced out of alignment by the bus work. Lift the trip bar by hand with the circuit breaker open to make sure that it does not bind.

### C-2. WIRING DIAGRAMS (Fig. 3)

A) Fig. 3 shows the typical control wiring for a type DBN-40S breaker. For complete details refer to diagrams in the Switchboard Technical Manual.

### C-3. SHUNT TRIPPING

A) Shunt-trip coils have a nominal voltage of 250 volts direct current, and a voltage range of 140 to 355 volts.

### C-4. ELECTRIC CLOSING (Not Available)

A) Due to the reduction in the size of the breaker frame, this DBN-40S is not supplied with electric closing.

### C-5. MAINTENANCE

A) The frequency of inspection for maintenance will depend upon local conditions but, in general, a complete inspection for preventive maintenance should be made at least once a year. It is recommended that a special inspection be given any breaker that has opened a heavy short-circuit current.

B) If excessive heating, not caused by over-current, is observed, look for loose or corroded contacts or connections.

C) When inspecting the circuit breaker, examine the contact surfaces. Rough or high spots should be removed with a clean file or sandpaper. Do not use emery cloth since the dust from this material is a good conductor of electricity and is sure to cause trouble if allowed to settle on insulating surfaces.

D) More detailed maintenance instructions are given later on in the sections on the individual attachments.

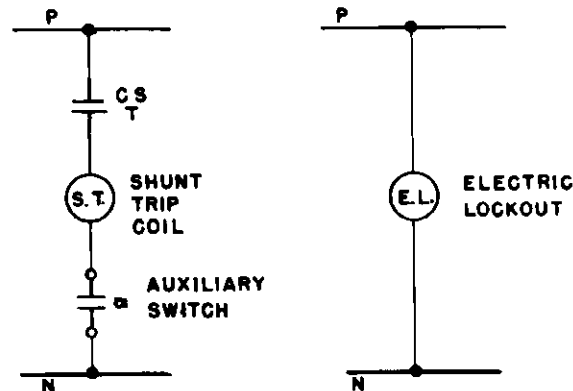


FIG. 3 — Air Circuit Breaker Control Wiring Diagrams  
(Dwg. 200-B-166-1)

## SECTION D—COMPONENTS AND ATTACHMENTS

### D-1. GENERAL ASSEMBLY (Manually Operated Breaker)

A) The DBN-40S Air Circuit Breaker is provided with two series-overcurrent-trip devices. Both poles are identical, each being provided with a stationary and a moving contact assembly and an arc chute.

### D-2. GENERAL ASSEMBLY (Remote Electrical Tripping)

A) The general assembly is not affected by the addition of a shunt trip for remote electrical tripping.

### D-3. ARC CHUTES (Fig. 4)

#### 1. Function

A) The arc chute '135', mounted above and surrounding the contact assembly of each pole, has the function of stretching and cooling the arc drawn by the separating contacts so that it may be quickly extinguished and the circuit opened in the least possible time. The arc chutes are an extremely important part of the circuit breaker; **the breaker should never be energized without the arc chutes being mounted in place.**

#### 2. Description

A) Each arc chute consists of a number of plates supported in a laminated case '135'. When the arc is drawn by the separating contacts, it moves up into the chute by magnetic and thermal action until it transfers from the stationary arcing contact '123', to the stationary runner contact '139'. After the arc transfers the current path is from upper stud '120', through blowout magnet coil '142', through disconnects '140 and 141', to stationary arcing runner '139'. The flow of current through blowout magnet coil '142', creates a high magnetic field between the iron plates on each side of arc chute which aids in forcing the arc up into the arc chute.

B) The arc chute can be removed by removing the front bolts and lifting it up and out. Disconnect '140 and 141', allowing the stationary arcing runner '139', to be disconnected from blowout coil '142'.

### D-4. CONTACT ASSEMBLY.(Fig. 4)

#### 1. Function

A) The contact assembly closes and opens the electric circuit through the circuit breaker. The upper stud '120', the stationary contact '121', the series-overcurrent-trip device '400', (when supplied) and the lower stud '105', are stationary and are mounted rigidly on the molded base '100'.

The moving contact assembly is hinged on the molded base by pin '127', and is moved in and out by molded insulating link '116', which is pivoted on cross bar '168', Fig. 2.

B) The moving contact assembly is closed and held in the closed position against the force of the accelerating spring '131', by the insulating link '116'. When the force exerted by the insulating link is released by tripping the breaker, the accelerating spring quickly moves the moving contact assembly to the "open" position. When the breaker interrupts high short-circuit currents, magnetic forces play a large part in the rapid opening of the contacts.

C) With the circuit breaker in the "closed" position, main contact surfaces '109 and 121', are held together and carry the load current. When the circuit breaker is tripped, arcing contact surfaces '119 and 123', snap together an instant before main contact surfaces '109 and 121', separate and then the moving contact assembly moves away, drawing the arc between the arcing contacts. This arrangement minimizes arc damage to main current-carrying contacts. When the circuit breaker is closed the arcing contact surfaces touch first and then separate as the main contacts touch and the closing operation is completed.

#### 2. Description

A) The stationary contact assembly consists of the main contact extruded integral with the upper stud '120', and the arcing contact '123', fastened to the extruded copper section by two screws '124'. Contact surfaces '121 and 123', are special arc-resisting silver-alloy inserts.

B) The moving contact assembly consists of a copper contact base '110', to which is fastened arcing contact '118', by two bolts '112', which are locked with locking clips '113'. Main and arcing contact surfaces '109 and 119', are silver-alloy inserts welded to their respective bases. Contact base '110', is riveted and soldered to shunt '108', which is bolted at its lower end either to a connector '133', when a series-overcurrent-trip device is not supplied, or to an overcurrent-tripping device. The shunt '108', is a flexible bundle of thin copper strips that carries current from the moving contact assembly to the lower stud. Contact base '110', is connected to contact link '106', with pin '115', and has a limited freedom of rotation about this pin. Contact link '106', is hinged by pin '127', to bracket '125', fastened to molded base '100', by two screws '128'. Pin '130', mounted in bracket '125', has the func-



# AIR CIRCUIT BREAKER

tion of restraining shunt '108', when the circuit breaker is tripped.

C) The moving contact assembly is attached to the mechanism cross bar '168', Fig. 2, by molded insulating link '116', which is screwed on metal link '111', and locked by nut '114'. When the breaker is tripped all force is removed from the cross bar and accelerating spring '131', quickly snaps the moving contact assembly from the closed to the open position.

### 3. Adjustments

A) The correct contact pressure of the DBN-40 is about 50 pounds. This pressure is obtained when the arcing contact surfaces are 3/32-inch apart when the breaker is closed. This gap may be adjusted after removing arc chute '135', by removing two screws '147', and cross bar '168'. Loosen locknut '114', and turn insulating link counter-clockwise, if the gap is too small, and clockwise if the gap is too large. The locknut should be retightened and the cross bar and arc chutes replaced.

### 4. Replacements

A) To replace moving arcing contact '118', and/or moving runner contact '138':

1. Remove arc chute '135', by means of bolts '147'.
2. Bend down locking clips '113', and remove bolts '112'. When replacing bolts be sure to relock them by bending up corners of clips.

B) To replace stationary runner contact '139':

1. Remove arc chute '135'.
2. Remove screws '144', freeing stationary runner contact '139', from arc chute.

C) To replace stationary arcing contact '123':

1. Remove arc chute '135'.
2. Removing screws '124', frees the contact.

D) To replace contact arm accelerating spring '131':

1. Remove arc chute '135'.
2. End of spring may be slipped off projection on contact arm and replaced.

### D-5. OPERATING MECHANISM (Fig. 5)

#### 1. Function

A) The operating mechanism opens and closes the circuit breaker contacts by moving the cross bar '168', Fig. 2, to which the moving contact assemblies are attached by insulating links. The breaker is closed manually by turning the operating handle quickly and smoothly as far as it will go (90°) in a clockwise direction. The breaker may be tripped manually by turning the handle 45° in a counter-clockwise direction. Handle Latch '224',

must be held while closing or tripping. The breaker is tripped automatically by one of the automatic devices described later which rotate trip lever '220', about pin '224'.

B) The mechanism is "trip free", that is, it is not possible to close the breaker if one of the automatic tripping devices moves the trip bar up during the closing stroke or if the trip bar is held in the raised position.

### 2. Description

A) The operating mechanism consists of a group of toggle links, and a latch attached to the operating mechanism frame on fixed pins '214, 226, 241, 216, and 224'. The cross bar '168', is held by the closing lever '207'. Rotating the operating handle clockwise moves the mechanism linkage from the open position shown in Fig. 5 to the closed position shown. This is accomplished when the roller '236', on the end of the operating handle shaft '232', forces the first toggle link '203', upward pushing second toggle link '204', third toggle link '206', and closing lever '207', ahead of it. The motion of the toggle linkages is directed by link '205', which is pivoted at its lower end on pin '217', in latch '208'. Latch '208', in turn is restrained from moving by roller latch '210', which is pivoted on pin '214', and engages trigger '221', on trip lever '220'. The linkage is held in the closed position by pawl '209', which latches under pin '227'. The handle shaft and lever are returned to the normal position after closing by handle-return spring '233'.

B) The mechanism is opened by rotating trip lever '220', counter-clockwise. This is accomplished either by rotating handle counter-clockwise, in which case the handle shaft lever strikes the extreme left end of trip lever '220', to move it downward; or by forcing push rod "E" of the tripping attachments to strike trip finger screw '243'. In either case the counter-clockwise rotation of the trip lever '220', moves trigger '221', out of engagement with the lower end of the roller latch '210', which in turn permits the roller latch to rotate counter-clockwise out of engagement with latch '208'. Latch '208', is then free to rotate in response to the pull of the latch link '205', so that the mechanism assumes the trip-free position shown in Fig. 5, in which the contacts are open but part of the mechanism levers are in the closed position. In this position pawl '209', is disengaged from pin '227', by a lug on link '204', which pushes it up permitting the linkage to collapse to the open position shown in Fig. 4.

C) Trip spring '234', returns operating handle to the normal vertical position after manual tripping.

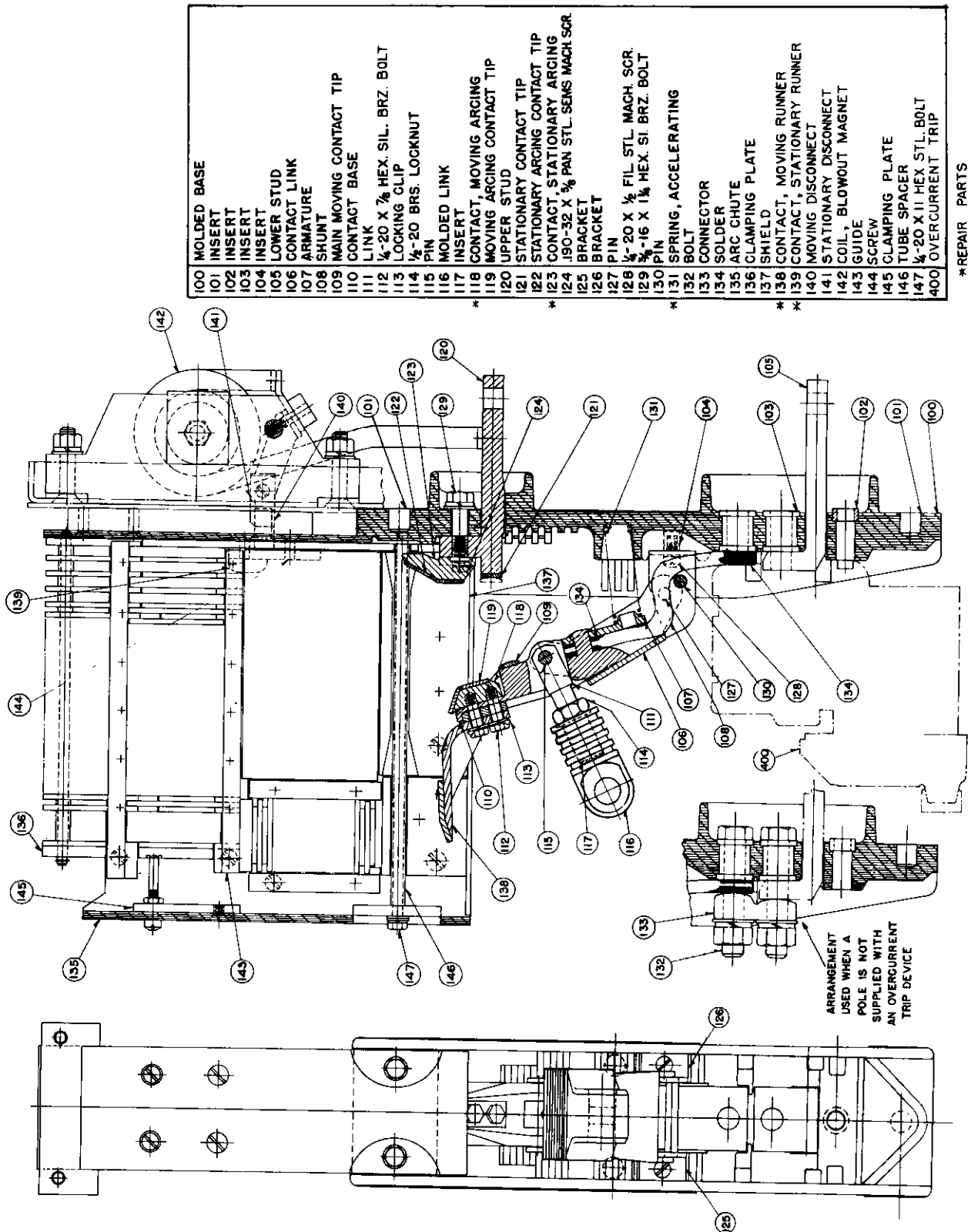
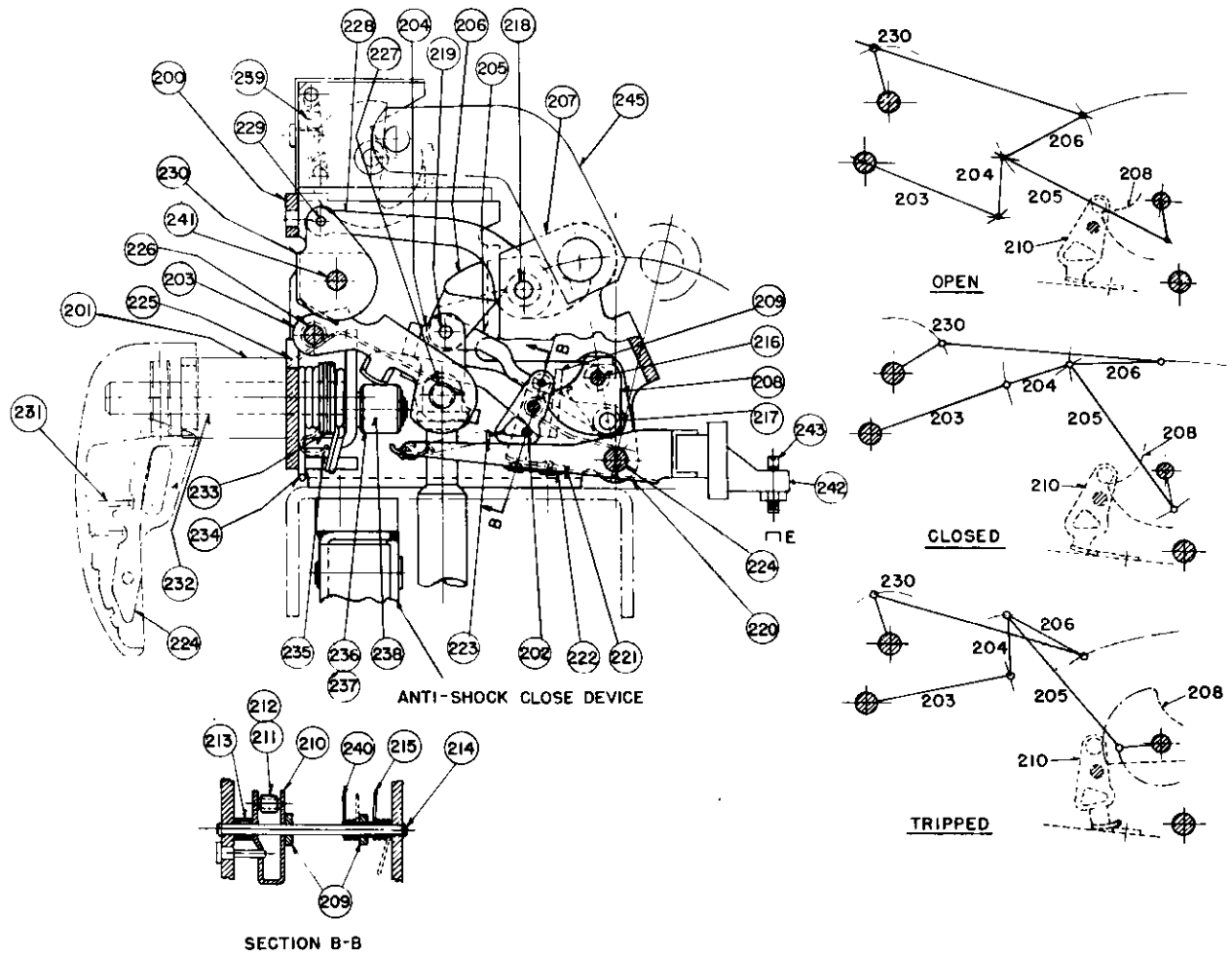


FIG. 4 — Air Circuit Breaker Arc Chute and Contact Assembly  
(Dwg. 500-F-210-1)

# AIR CIRCUIT BREAKER



200	MECH. FRAME	* 223	SPRING, ROLLER LATCH
201	BEARING	224	LATCH, HANDLE
202	LATCH STUD PIN	* 225	SPRING, RETRIEVE
203	FIRST TOGGLE LINK	226	PIN
204	SECOND TOGGLE LINK	227	PIN
205	LINK	228	INDICATOR LINK
206	THIRD TOGGLE LINK	229	PIN
207	CLOSING LEVER	230	INDICATOR
208	LATCH	231	SPRING, HANDLE LATCH
209	PAWL	232	SHAFT
210	ROLLER LATCH	* 233	SPRING, HANDLE RETURN
211	ROLLER	* 234	SPRING, TRIP
212	PIN	235	LEVER
213	SPACER	236	ROLLER
214	PIN	237	NEEDLE BEARING
* 215	SPRING, L. H. PAWL	238	PIN
216	PIN	* 239	SPRING, ANTI-BOUNCE RETURN
217	PIN	* 240	SPRING, R. H. PAWL
218	PIN	241	PIN
219	PIN	242	TRIP FINGER
220	TRIP LEVER	243	SCREW
221	TRIGGER	244	5/16-24 SET SCREW
222	SPRING PLATE STOP	245	ANTI-BOUNCE LATCH

REPAIR PARTS

FIG. 5 — Air Circuit Breaker Operating Mechanism  
(Dwg. 47-A-1580-1)

### 3. Anti-Bounce Latch

A) The anti-bounce latch '245', prevents the closing lever '207', from bouncing off its stops and reclosing the circuit when the circuit breaker interrupts maximum short-circuit currents. When the circuit breaker interrupts these high currents, the top of the closing lever knocks the latch upward, causing the latch to engage the closing lever should it tend to return to the closed position. The latch is mounted on top of the mechanism frame.

### 4. Position Indicator

A) Position indicator '230', is formed from sheet metal and is pivoted on pin '241'. It is visible from the front of the circuit breaker through a window in the faceplate and mechanism frame. See Fig. 2. With the circuit breaker in the open position shown in Fig. 5, the yellow face of the indicator shows through the window. The word "OPEN" is stamped on this yellow face. When the breaker closes, pin '218', of the closing lever '207', pulls indicator link '228', to the right, thus rotating the other face of the indicator up into a position visible through the window. This face is painted blue and is stamped with the word "CLOSED".

### 5. Replacements

A) To replace roller latch spring '223':

1. Prepare to remove mechanism by removing anti-shock-open device '250', terminal block '169', and auxiliary switch '550', all of Fig. 2. Avoid removing any more wires than necessary. It will usually be possible to push the devices aside without removing the wiring. Tag any wires which may have to be removed.
2. Rotate handle '166', clockwise until pin '277', is visible through a hole in the right side of the mechanism frame. Using a small rod as a pusher, shove this pin part way through the hole until the rod of the anti-shock-close device, in the case of manually operated circuit breakers, or the operating rod of the closing magnet, in the case of electrically operated circuit breakers, drops off. Return the pin '277', to its proper location and allow linkages to fall open. This frees mechanism from anti-shock-close device or the closing magnet as the case may be.
3. Remove handle '166', faceplate '155', and cross bar '168', of Fig. 2.
4. Remove the four bolts which hold mechanism to the shelf '152', Fig. 2. This frees mechanism from shelf but frees also either anti-shock-close device '360', of manually operated breakers, or closing magnet '340', of electrically operated breakers. These devices should be temporarily replaced while repairs are being made to the mechanism.

5. Removal of pin '224', enables trip lever '220', to be removed and spring '223', may then be replaced.

B) To replace pawl springs '215 and 240':

1. Repeat operations (1) through (5) above.
2. Remove pin '214', far enough to release pawl '209'. Roller latch '210', and hold-in which are pivoted on the same pin will then remain in place. Replace springs '215 and 240', making sure that their ends are supported correctly as indicated in Fig. 5.

C) To replace trip spring '234', or handle return spring '233':

1. Repeat operations (1) through (5) under "Replacement of Roller Latch Spring".
2. Remove pin '214', and drop pawl '209', and roller latch '210', out of frame.
3. Remove snap ring from handle shaft '232', and push handle shaft back into frame. Spring '233 or 234', may then be replaced.

D) To replace retrieve spring '225':

1. Repeat operations (1) through (5) under "Replacement of Roller Latch Spring".
2. Remove cover '239'.
3. Remove pins '241 and 226'. Retrieve spring '225', may then be replaced.

E) When replacing mechanism springs, particular attention should be given to the mechanism drawing Fig. 5 to see that spring ends are properly placed and that torsion springs are properly oriented to exert torque in the proper direction.

## D-6. ANTI-SHOCK-CLOSE DEVICE (Fig. 6)

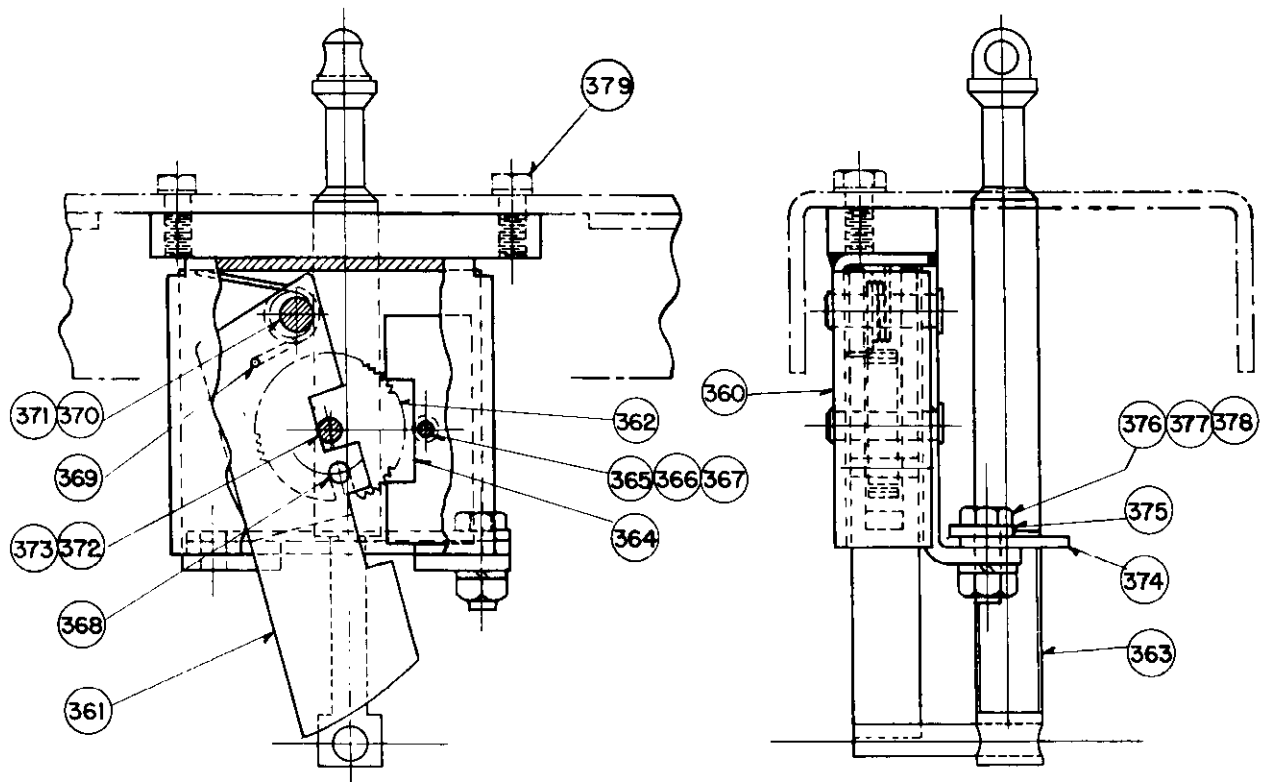
### 1. Function

A) This device serves to prevent the circuit breaker contacts from closing from shock when open. This is accomplished by an arrangement whereby a mechanical escapement device or "ticker" is operated by the closing of the breaker. Shock blows tending to close the breaker are of such short duration that the mechanical escapement device does not have time to operate and the device effectively locks the open circuit breaker in the open position under shock conditions.

### 2. Description

A) The anti-shock-close device consists of a ticker case '360', Fig. 6, which contains the ticker assembly, bolted to the platform by two bolts '379'. A rod and cam pusher assembly '363', is connected at its upper end to pin '227', Fig. 5, of the mechanism. Whenever circuit breaker is closed, rod '363', is pulled up by pin '227', and cam '361', is caused to rotate in a clockwise direction around pin '370',

# AIR CIRCUIT BREAKER



360	CASE
361	CAM
362	WHEEL
363	ROD AND CAM PUSHER
364	OSCILLATOR
365	PIN
366	.190 STD. BRS. WASHER
367	SNAP RING
368	PIN
* 369	SPRING, RESET

\* REPAIR PARTS

370	PIN
371	SNAP RING
372	PIN
373	SNAP RING
374	GUIDE
375	GUIDE
376	5/16-18 X 7/8 HEX. STL. BOLT
377	5/16-18 HEX. MACH. SCR. NUT
378	5/16 STL. LOCKWASHER
379	BOLT

FIG. 6 — Air Circuit Breaker Anti-Shock-Close Device  
(Dwg. 22-B-1624-2)

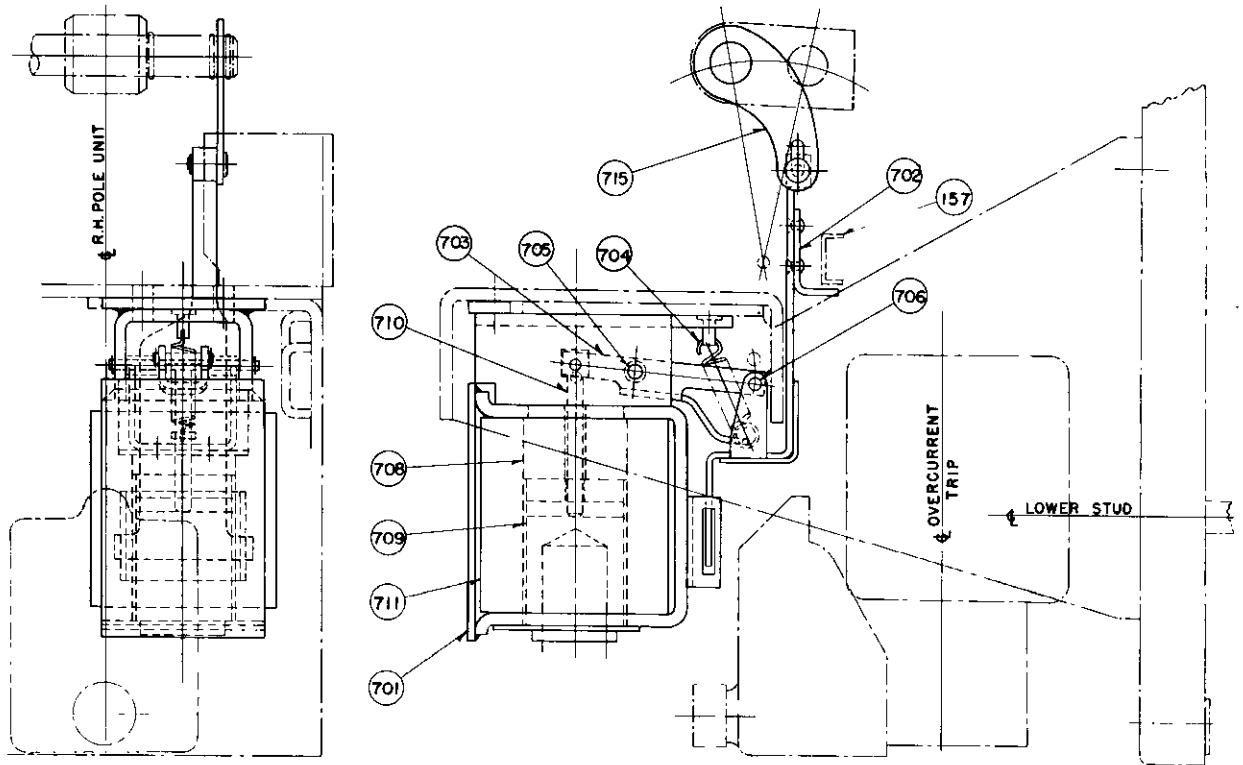
against the torsion of return spring '369'. As the cam rotates in this manner, oscillator wheel '362', is caused to rotate clockwise around pin '372', by pin '369', mounted in cam '361'. The rotation of wheel '362', is regulated by mechanical oscillator '364', which is pivoted on pin '365'. This oscillator oscillates due to the engagement of its teeth with the teeth of oscillator wheel '362'. When the circuit breaker is tripped, rod '363', drops unimpeded and return spring '369', returns cam and consequently oscillator wheel to the "breaker open" position shown in the figure.

B) Shock blows tending to close the circuit breaker would have to act in such a way as to raise rod '363'. These blows are of such short duration that the cam is restrained long enough by the oscillator wheel and oscillator to prevent closing of the circuit breaker.

### 3. Replacements

A) To replace return spring '369':

1. Remove handle '166', and faceplate '155', Fig. 2.
2. Remove guide pieces '374 and 375', by removing bolt '376'.



157	TRIP BAR	705	PIN	* 711	COIL
701	FRAME	706	PIN	715	CROSS BAR LINK
702	LOCKING LEVER	708	STATIONARY CORE		
703	LEVER	709	MOVING CORE		
* 704	OPERATING SPRING	710	PLUNGER ROD		* REPAIR PARTS

FIG. 7 — Air Circuit Breaker Electric Lockout Device  
(Dwg. 32-B-5807-1)

3. Remove bolts '379', and remove case '360', from shelf.
4. Removing snap rings '367, 371 and 373', will allow corresponding pins to be removed. The various parts are then free to be removed and the spring may be replaced.
5. After reassembly, be sure that the cam operates freely and that it returns freely to its starting position when pushed over.

#### D-7. ELECTRIC LOCKOUT (Fig. 7)

##### 1. Function

A) This device will prevent the circuit breaker from being closed unless its coil '711', is energized. It does this by holding up the trip bar and thus holding the circuit breaker in the "trip free" position.

##### 2. Description

A) The device is bolted to the underside of the circuit breaker platform under the shunt-trip device.

B) It consists of a coil '711', a stationary core '708', a moving core '709', a frame '701', and a system of linkages to the trip bar and cross bar.

C) When coil '711', is de-energized, moving core '709', drops down and lever '703', rotates counter-clockwise around pin '705', in response to pull of operating spring '704'. This counter-clockwise rotation of lever '703', pulls up locking lever '702', through pin '706', which in turn lifts trip bar '157'.

D) When coil '711', is energized, moving core '709', moves up in response to the magnetic attraction between it and stationary core '708', pushing

# AIR CIRCUIT BREAKER

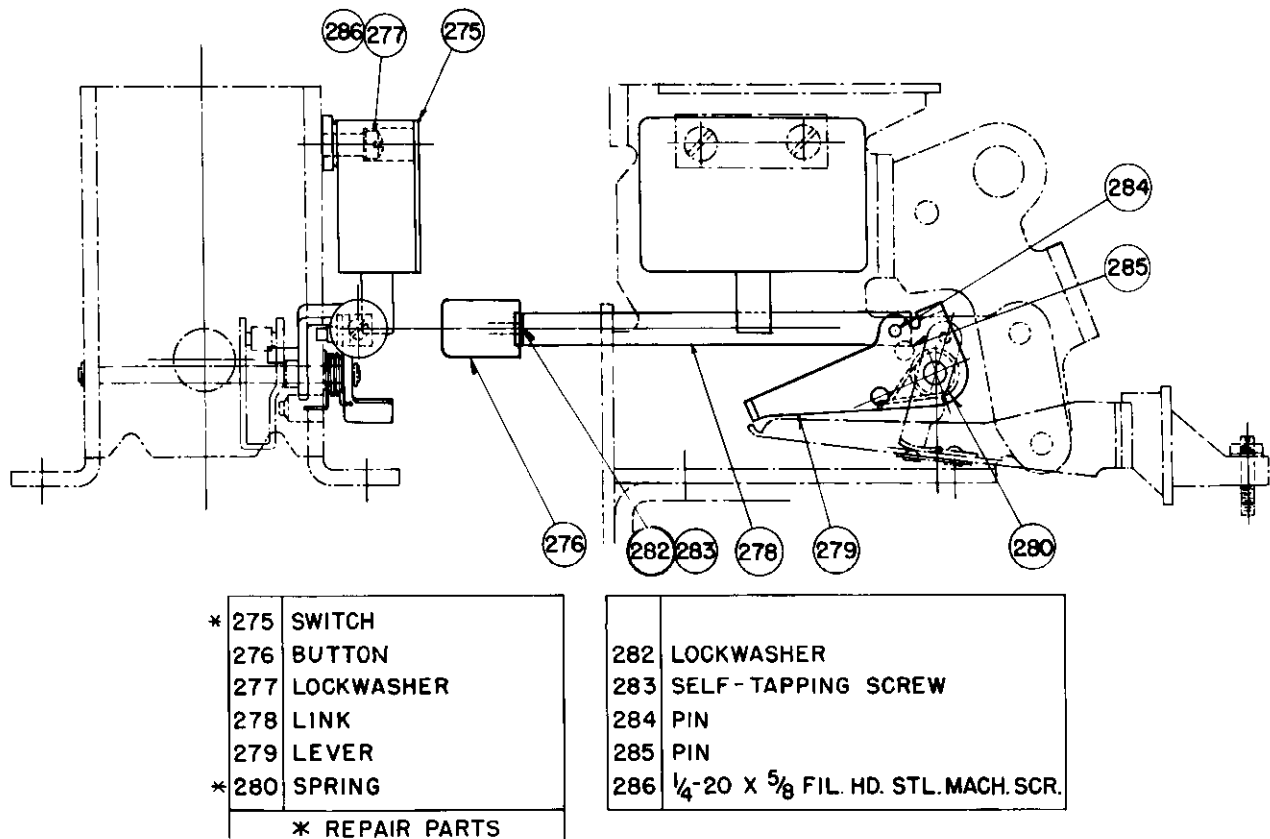


FIG. 8/9 — Air Circuit Breaker Hold-in Device and Hold-in Switch  
(Dwg. 300-C-260-1)

with it plunger rod '710', which turns lever '703', clockwise against the tension of spring '704'. This rotation allows locking lever to drop and allows trip bar to reset.

E) When the circuit breaker is closed, cross bar link '715', is moved by the cross bar to such a position that the electric lockout is inoperative. In other words, with the breaker closed, locking lever '702', is held down regardless of whether or not the coil '711', is energized.

### 3. Replacements

A) Coil '711', or spring '704', may be easily replaced after removing the device from the circuit breaker platform.

### D-8. HOLD-IN-DEVICE (Fig. 8)

#### 1. Function

A) This device prevents manual or automatic tripping of the circuit breaker as long as the hold-in button '276', is pushed in. No provision is made to lock it in the hold-in position.

B) If an overcurrent of greater magnitude than

the long time delay pickup setting occurs during the time the hold-in button is pressed in and persists long enough to have tripped the circuit breaker had the button not been pressed, the circuit breaker will trip out upon release of the hold-in button.

C) An exception to the above statement occurs when the current after an overcurrent drops to a value lower than 30% of coil rating in which case the trip devices will reset and the breaker will not trip.

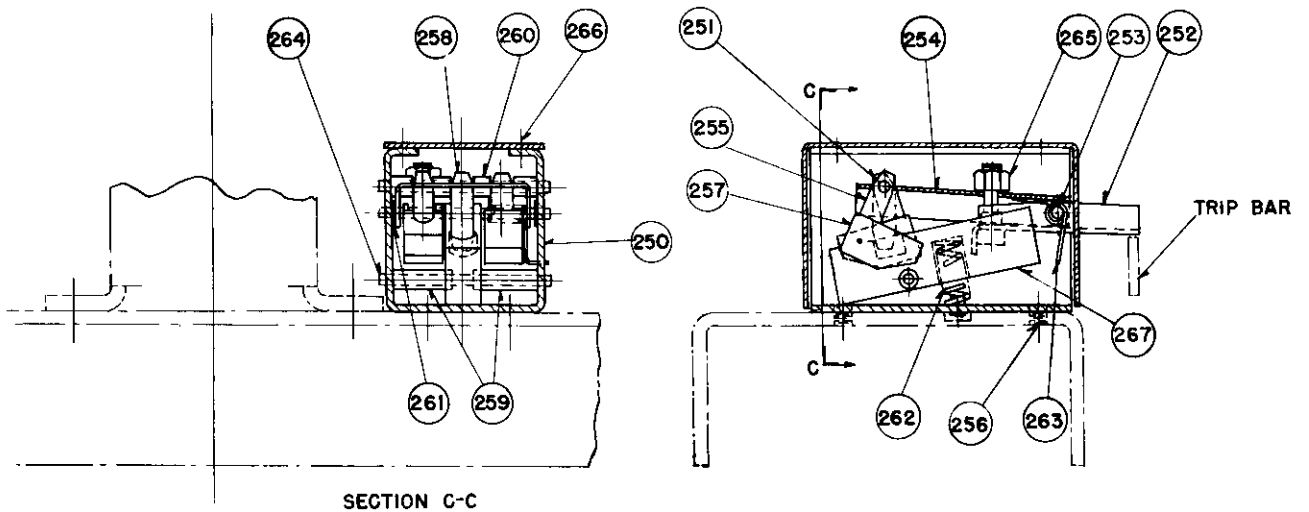
### 2. Description

A) Pushing on button '276', rotates lever '279', clockwise about pin '214', of mechanism. See Fig. 5. Pin '285', which is a part of link '278', is forced against roller latch '210', of Fig. 5, to hold it inoperative regardless of tripping impulses. In other words, trip lever '220', is free to move without tripping the breaker.

### 3. Replacements

A) To replace return spring '280':

1. Remove anti-shock-open device '250', Fig. 1, from shelf thus exposing hold-in device.



250	ANTI-SHOCK OPEN BRACKET
251	PIN
252	LEVER
253	PIN
254	PLATE
255	STUD
256	SCREW
257	WEIGHT
258	STUD

259	SPACER
260	SPACER
261	WASHER
* 262	SPRING WEIGHT
* 263	SPRING PLATE
264	PIN
265	1/4-20 ELASTIC STOP NUT
266	.164-32 X 1/4 FIL.HD.STL.MACH.SCR.
267	WEIGHT

FIG. 10 — Air Circuit Breaker Anti-Shock Open Device  
(Dwg. 22-B-1622-1)

2. Remove snap ring from end of pin '214', Fig. 5, and slip lever '279', off pin. Replace spring.

**D-9. HOLD-IN-SWITCH (Fig. 9)**

**1. Function**

A) This switch protects the shunt-trip coil when the hold-in device is used.

**2. Description**

A) When the hold-in device is operated, an extension on lever '279', pushes button of switch '275', upward to open the shunt-trip coil circuit through hold-in contact and thus prevent overheating of the coil should the shunt-trip coil be energized during the time the hold-in device is held in.

**3. Replacements**

A) To replace switch '275':

1. Remove cover of switch and disconnect wiring.

2. Removal of two screws '286', frees the switch for replacement.

**D-10. ANTI-SHOCK-OPEN DEVICE (Fig. 10)**

**1. Function**

A) This device prevents tripping of the circuit breaker due to rotation of the trip lever caused by shock but allows normal rotation of the trip lever by tripping devices.

**2. Description**

A) The bracket '250', is mounted on the supporting frame shelf to the immediate right of the operating mechanism frame '200', Fig. 1, and is held to the shelf by two bolts '256'. Lever '252', is pivoted on pin '253', as is plate '254'. Lever and plate are connected by bolt and elastic stop nut '265', in such a way that if the trip bar raises, lever '252', rotates counter-clockwise around pin '253', and plate '254', is caused to rotate in the same direction. Conversely, if plate '254', is restrained from rotating, trip bar is held down by lever '252'. Under shock conditions, plate '254', is restrained from moving in the following manner:

B) Studs '255 and 258', are suspended on pin '251', and plate '254', is fitted with a slot in its end arranged so that the plate will slide down and allow the circuit breaker to trip under normal trip-

35-224-C7



# AIR CIRCUIT BREAKER

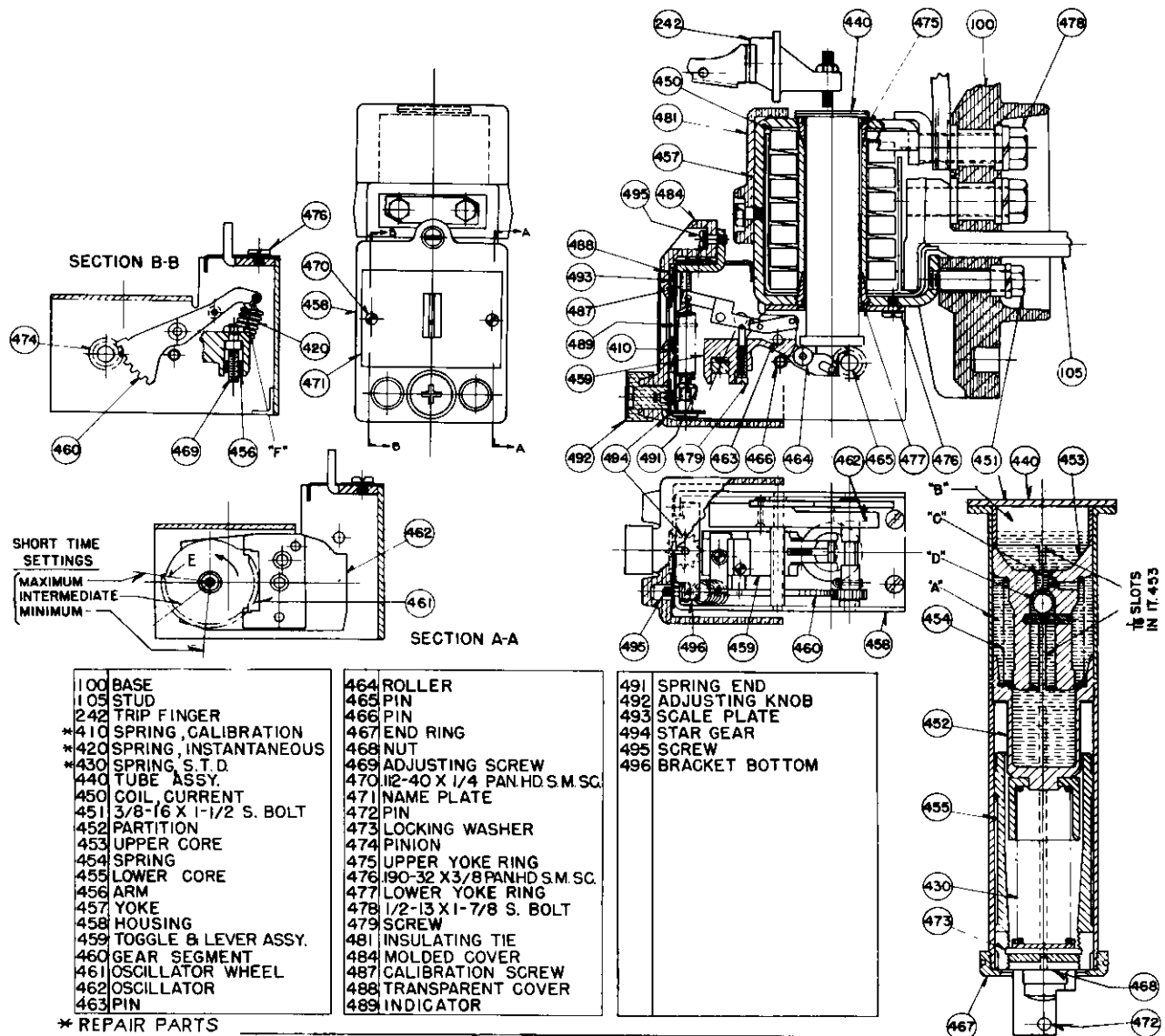


FIG. 11 — Air Circuit Breaker Series-Overcurrent Trip Device  
(Dwg. 32-A-6812-3)

ping impulses. Under shock conditions, however, the two outboard studs are caused to rotate around pin '251', due to the off-center weights '257', thus jamming the plate '254', from sliding down. The middle stud is actuated by a separately pivoted weight '267', which rotates about pin '264'. Spring '262', serves to hold weight in position shown during normal operation.

### 3. Replacements

A) To replace plate spring '263':

1. Remove cover by removing screws '266'.
2. Remove device from shelf by removing two screws '256'.

3. Remove right-hand snap ring from pin '253', and withdraw pin '253', far enough to free spring '263'.

### 4. Adjustment

A) With the breaker closed any motion of trip bar '157', should cause plate '254', to move down. Pushing trip bar down about 1/16-inch should cause 1/32-inch or less upward motion of slotted end of plate '254'. Adjustment should be made with breaker open by turning nut '265'.

**D-11. SERIES OVERCURRENT TRIP DEVICE (Fig. 11)**

**1. Function**

A) This device provides for selective protection of the various portions of the electrical system under three distinct conditions of current: First, for low overcurrent values, it will trip the breaker after a LONG DELAY; second, for higher overcurrent values, it will trip the breaker after a SHORT DELAY; and third, for still higher values of overcurrent, it will trip the circuit breaker INSTANTANEOUSLY.

**2. Description**

A) The device is actuated by an electromagnet connected in series with the moving contact assembly and the lower stud of the circuit breaker. When a low overcurrent exceeds the "LONG DELAY" pickup, the overcurrent will start to trip the breaker. If the overcurrent continues above the set value for the long time-delay period as determined by an oil-displacement piston, the circuit breaker will trip.

B) Unlike the long time-delay pickup, the SHORT DELAY pickup calibration is set at the factory at the ampere-setting marked on the nameplate, and is not readily adjustable in the field. The operating time consists of three different time settings: minimum, intermediate and maximum time. If an overcurrent occurs of greater magnitude than the short time-delay pickup setting, the circuit breaker will trip subject to a short time-delay as determined by a gear escapement mechanism without waiting for the longer time-delay of the oil-displacement piston.

C) At currents above the instantaneous setting, the circuit breaker trips without any intentional time-delay. The pickup setting is made at the factory at some ampere value from 5 to 30 times the series-overcurrent-trip-coil rating and is not readily adjustable in the field.

D) If during the long or short time-delay period the current drops to 100% of rated overcurrent-trip-coil current, the series-overcurrent-trip device will reset and the breaker will not trip provided the overcurrent has not persisted beyond the time indicated by the lower edge of the band curve for the particular breaker involved. If the current drops to a lower value than 100% of rated series-coil current, the electrical reset time is increased in proportion.

**3. Long Delay**

A) Sealed enclosed tube assembly '440', consists essentially of an upper core '453', an upper core spring '454', a lower core '455', a short-time-delay spring '430', and the tube. Space "A" is filled with a special fluid having a high viscosity. Partition '452', seals off this oil compartment from lower tube.

B) With an overcurrent less than the pickup setting of the short-time-delay device, upper core '453', remains in a fixed position relative to yoke '457', due to magnetic attraction between core and yoke through the tube wall, but lower core '455', moves upward in response to the magnetic pull between the upper and lower cores. Since the magnitude of the current is not sufficient to compress the short-time-delay spring '430', tube '440', also moves upward with lower core '455', forcing the liquid from space "A" to space "B" through orifice "C" in upper core '453'. After tube '440', trips the breaker, the tube falls to its lower position carrying core '453', along with it. Then spring '454', returns the upper core '453', to its normal position, forcing the liquid back from space "B" to space "A" through a quick-reset check valve "D".

**4. Short Delay**

A) The pin '472', in lower core '455', is attached to a mechanical escapement device enclosed in housing '458'. This device consists of a lever '459', pivoted on a fixed pin '463', and connected through instantaneous spring '420', to gear segment '460', which operates pinion '474', and oscillator wheel '461', which is on the same shaft. Oscillator wheel '461', is impeded from free rotation by oscillator '462'.

B) With overcurrents of sufficient magnitude to compress short-time-delay spring '430', but not sufficient to extend instantaneous spring '420', lower core '455', moves upward rotating lever '459', counterclockwise to operate the mechanical device; also roller '464', which is a part of lever '459', bears against the end ring '467', which is a part of tube assembly '440', to raise it and trip the breaker. Upper core '453', is carried along with tube '452', as the liquid does not have time to flow from space "A" to space "B".

**5. Instantaneous Trip**

A) With fault currents of sufficient magnitude to extend instantaneous spring '420', the operation is identical with the above except that the upward motion of lower core '455', is not restrained by oscillator '462', due to the extension of instantaneous spring '420'.

## 6. Adjustments

### CAUTION

The only adjustment which can be made while the circuit breaker is energized is the long time delay pickup adjustment. When making this adjustment, use extreme care not to touch any part of the device except knob '492', or molded cover '484'.

A) To change the pickup-current setting of the long-time-delay device, turn adjusting knob '492'. Raising indicator '489', will lower pickup.

B) To change the pickup-current setting of the short-time-delay device, it is necessary to change short-time-delay spring '430':

1. Remove two bolts '478', and bolt '451', from the back of panel and remove the trip device.

2. Remove two screws '495', molded cover '484', and transparent cover '488'.

3. Remove three screws '476', and drop the housing '458', from the yoke assembly '457'.

4. Remove spring clip in end ring '467', and unscrew end ring thus freeing lower core '455', and short-time-delay spring '430'. Care must be taken that the prongs of locking washer fit into slots in lower core when replacing the spring. The spring which is used for replacement must have been previously tested and tagged at the factory to give the desired characteristics.

C) To change the short-time-delay band:

1. Perform B) 1. and 2. above, push segment '460', with a thin screwdriver at "F" in direction shown by arrow to disengage gear pinion wheel '474', from segment '460'. Turn gear pinion '474', one tooth clockwise to increase the short-time-delay and one tooth counterclockwise to decrease the time delay. If a closer adjustment is wanted, turn

screw '479', in to increase time delay and out to decrease the short-time-delay. This screw '479', must be locked in place by pin-pricking the casting '459', near the screw.

D) To change the instantaneous trip current pickup:

1. Perform B) 1. and 2. above. Remove scale plate '493', and unhook upper ends of calibration springs. Pull out bottom of calibration screw '487', and star gear '494', from bracket bottom '496'. Take care to leave indicator '489', in same place on calibration screw when laying this assembly aside. Remove screw and nut '469', unhook spring '420', from arm '456', and segment '460', and replace with new spring having the desired pickup-current characteristics. Minor variations in instantaneous pickup may be obtained by turning screw '469', in and out. Turning screw in increases the pickup and turning the screw out decreases the pickup current. This screw must be locked by pin-pricking arm '456', near it.

## 7. Replacements

A) To replace short-time-delay spring '430': Proceed as described under Adjustments B) 1., 2., 3., and 4. above.

B) To replace instantaneous spring '420', or calibration spring '410': Proceed as described under Adjustments D) 1.

### NOTE

Any adjustments or replacements on the overcurrent attachment should be regarded as temporary, pending recalibration or replacement of the complete overcurrent attachment. Adjustments of the short-time-delay time and the instantaneous-pickup setting are not recommended unless absolutely necessary.

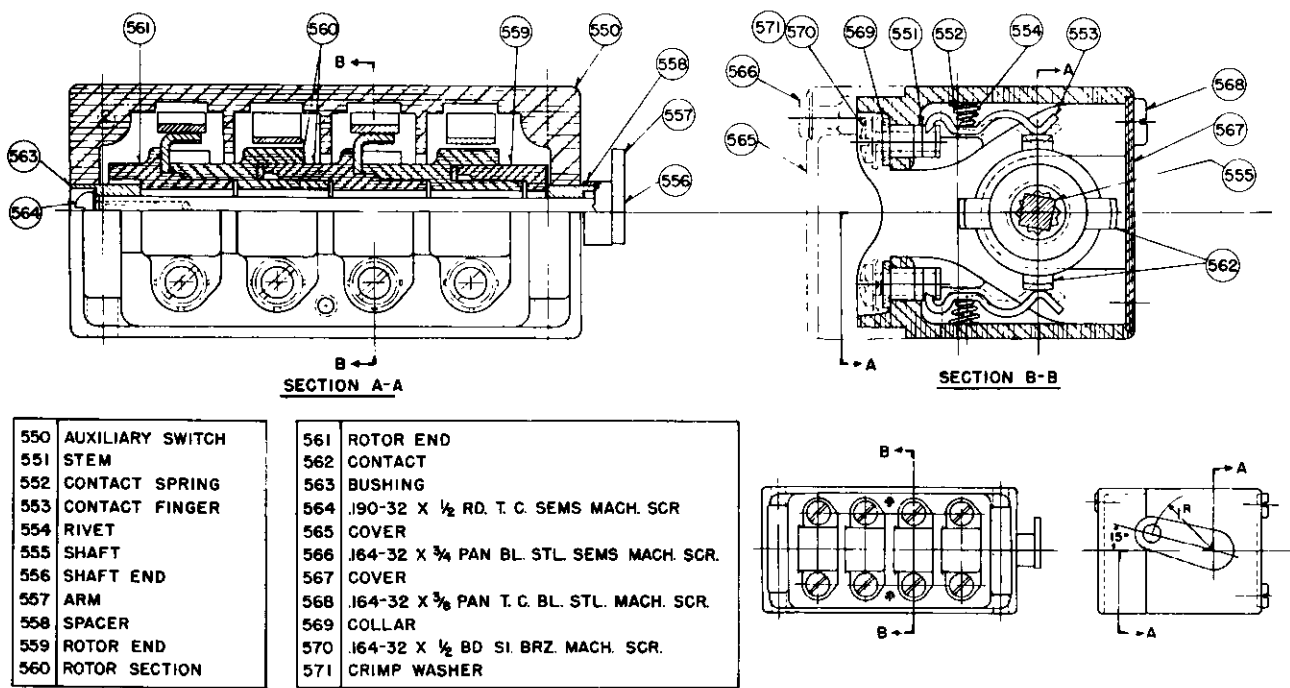


FIG. 12 — Auxiliary Control Switch  
(Dwg. 32-A-6819-3)

**D-12. AUXILIARY SWITCH (Fig. 12)**

**1. Function**

A) The auxiliary switch is used to close or open auxiliary or control circuits. The closed or open positions of its sets of contacts are coordinated with the closed or open positions of the main circuit breaker contacts.

**2. Description**

A) The four-pole Type "RC" auxiliary switch is mounted on the top of the supporting frame shelf to the left of the operating mechanism. It is operated by shaft '555', and arm '557', which connects to the breaker lever of the operating mechanism. An eight-pole auxiliary switch consists of two four-pole switches, one mounted above the other.

B) The contacts are designed to carry 15 amperes continuously or 250 amperes for three seconds.

C) The auxiliary switch is a shaft-operated, four-pole, rotary-type having "a" and "b" contacts. An "a" contact is one that is open when the circuit breaker is open, and a "b" contact is one that is closed when the circuit breaker is open.

D) A square shaft '555' extends through the rotor molds '560', which in turn insulate and support the rotor contacts '562'. The rotor assembly is clamped together into a solid unit by screw '564'.

The rotor contacts are set 60° apart for 60° rotation of shaft '555'.

E) Contact fingers '553', have one end hooked into stem '551', with spring '554', maintaining pressure between the finger contact and stem. The center of the contact finger bears against a stop surface in casing '550', to position the outer end of the contact finger.

**3. Replacement of Auxiliary Switch**

- A) Remove and tag the terminal connections.
- B) Disconnect arm '557', from closing lever, remove the two mounting bolts and remove switch.
- C) Remove link from closing lever and add new switch.

**D-13. SHUNT-TRIP DEVICE (Fig. 13)**

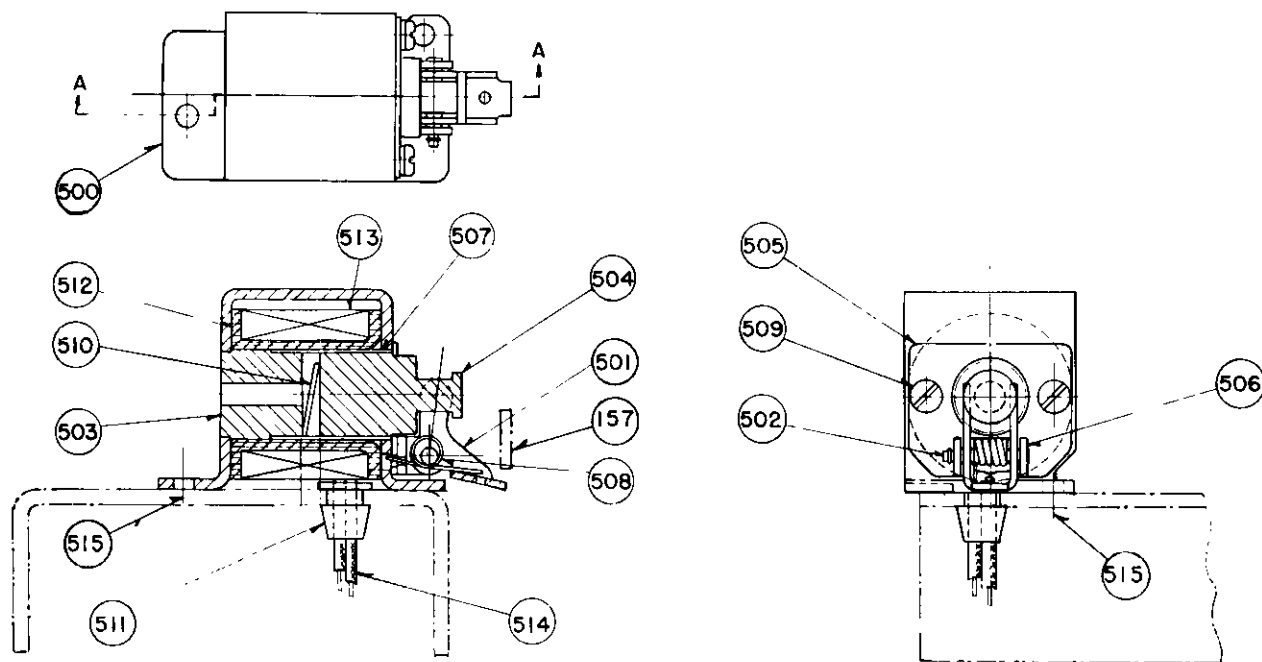
**1. Function**

A) The shunt-trip device serves as a means of tripping the circuit breaker from some remote point by the closing of a control switch or relay contacts at that remote point.

**2. Description**

A) The shunt-trip device is mounted on the extreme right end of the supporting frame shelf. It consists of a frame, coil and moving core mounted horizontally. Energizing trip coil '513', causes a

# AIR CIRCUIT BREAKER



SECTION A-A

500	SHUNT TRIP FRAME
501	TRIP LEVER
502	PIN
503	STATIONARY CORE
504	MOVING CORE
505	PLATE
506	BRACKET
507	SLEEVE
* 508	SPRING , RESET

509	SCREW
510	WASHER
511	BUSHING
512	COIL SPOOL
* 513	COIL
514	LEADS
515	BOLTS
157	TRIP BAR
*REPAIR PARTS	

FIG. 13 — Air Circuit Breaker Shunt-Trip Device  
(Dwg. 22-B-1625-2)

magnetic attraction between stationary core '503', and moving core '504', which causes moving core '504', to move to the left rotating trip lever '501', about pin '502'. Lever '501', raises trip bar '157', Fig. 1, to trip the circuit breaker. The opening of the circuit breaker de-energizes the shunt-trip coil through an "a" contact of the auxiliary switch. See Section D-12. Spring '508', returns moving core '504', to its normal position. Non-magnetic washer '510', prevents residual magnetism from holding the cores together when the coil is de-energized.

### 3. Replacements

#### A) To replace coil '513':

1. Disconnect the shunt trip leads from the auxiliary switch and cut-off switch.

2. Take out the two bolts '515', and remove the shunt-trip assembly from the supporting frame.
3. Remove pin '502', and screws '509', holding plate '505', in place and drop out the moving core '504', stationary core '503', and sleeve '507'. The coil is then free to be replaced.

#### B) To replace spring '508':

1. Repeat operations (1) and (2) above.
2. Remove pin '502', and replace spring '508'.

### D-14. REPAIR PARTS

A) Potential coils, springs, arcing contacts, and auxiliary switches are supplied as repair parts. For style number identification refer to certification data sheets listed on Page 3.









AIR CIRCUIT BREAKER

**CERTIFICATION DATA FOR CIRCUIT BREAKERS**

A. MASTER DRAWING S6205-H-3198872 REVISION 0  
 B. MFR'S DRAWING NO. JH448 REVISION  
 C. MASTER DRAWING FIGURES APPLICABLE TO CONTRACT 1-3  
 WIRING DIAGRAM  
 D. APPLICABLE SPECIFICATION MIL-C-1938 OF  
 AND AMENDMENTS OF  
 E. NAVY CONTRACT OR SHIPBUILDER'S ORDER NO. NOBS-3599  
 F. MFR'S ORDER NO. G.O. HR-44957Y 50-32-Y-9858  
 G. CIRCUIT BREAKER TYPE AND FRAME SIZE-NAVY ACB 600 FRAME  
 MFR'S DBN-405  
 H. DESCRIPTION OF CIRCUIT BREAKER  
 VOLTAGE 1000 D.C. MEANS OF CLOSING MANUAL  
 NO. OF POLES 2 NO. OF OVERCURRENT COILS 2  
 CONNECTIONS BACK MOUNTING DEAD FRONT  
 AUXILIARY SWITCH CIRCUITS  
 OVERCURRENT TRIPPING CURVE MFR'S NO. 405417\*(FEEDER BRK)  
 I. COIL RATINGS, PICKUP AND TIME SETTINGS:  
 1. OVERCURRENT COIL RATING-AMPERES 160  
 2. LONG-TIME DELAY PICKUP SETTING-AMPERES 320  
 3. SHORT TIME DELAY PICKUP SETTING-AMPERES NONE \*  
 4. SHORT TIME DELAY BAND SETTING NONE \*  
 5. INSTANTANEOUS PICKUP SETTING 800 \*  
 6. SHUNT TRIP COIL RATING-VOLTS NONE  
 7. CLOSE COIL RATING-VOLTS NONE  
 8. CLOSING RELAY COIL RATING-VOLTS NONE  
 9. REVERSE CURRENT TRIP SETTING-AMPERES NONE  
 10. REVERSE CURRENT POTENTIAL COIL-VOLTS NONE  
 J. NUMBER OF SHIPS INVOLVED 1  
 K. IDENTIFICATION NUMBERS OF SHIPS SS576  
 L. NUMBER OF CIRCUIT BREAKERS PER SHIP 6  
 M. TOTAL NO. OF CIRCUIT BREAKERS INVOLVED 6  
 N. REPAIR PARTS SHEET NO. 2  
 O. ADDITIONAL DATA, REMARKS, NOTES:-  
 \* FOR 3 BRKRS. - SEE NOTE ON SHEET 2 FOR OTHER 3 BRKRS.

<b>DRAFTSMAN</b> THOMPSON	<b>DATE</b> 3-2-55	<b>CERTIFIED</b> 3-4-55	<b>BUSHIPS APPROVAL</b> LETTER	<b>CERTIFICATION DATA</b> TYPE DBN-405 AIR CIRCUIT BREAKER FEEDER BREAKER	<b>WESTINGHOUSE ELECTRIC CORPORATION</b> EAST PITTSBURGH PA. USA. DWG 33 B 6497 SUB 3
				<b>BUSHIPS DWG NO.</b>	<b>REV.</b>
				B] * ON SHEET 1 + 17-20+21 ON SHEET 2 WHERE NOT ON AND LINE H WAS 388711	B
				<b>SHEET 1 OF 2</b>	

**REPAIR PARTS LIST**  
 NAVY CONTRACT - NOBS-3599  
 WESTINGHOUSE G.O. HR-44957Y S.O. 32-Y-9858

ITEM NO.	QUANTITY	NAME OF PART	IDENTIFICATION		STANDARD NAVY STOCK NO.
			STYLE NO.	DRAWING NO.	
1	12	CONTACT - MOVING, ARCING	1640374	15-C-5581	P17WX-2508
2	12	CONTACT - STATIONARY, ARCING	1766536	21A3599	P17WX-3350
3	6	SPRING - ACCELERATION	1491496	9D-9360	P205-10804
4	6	SPRING - PAWL	1718591	26-D-2194	P42 WX-3289
5	6	SPRING - ROLLER LATCH	1584498	21D7688	P42 WX-3290
6	6	SPRING - RETRIEVE (MECH)	1491446	13D-6586	P205-10802
7	6	SPRING - TRIP (MECH)	1491444	13D-3193	P205-10801
8	6	SPRING - HANDLE RETURN	1491497	13D-3193	P205-10807
9	6	SPRING - WEIGHT (AS OPEN)	1404668	9D-9236	P205-10808
10	6	SPRING - RESET (AS OPEN)	1574793	18D-6418	P205-10805
11	6	SPRING - RESET (AS CLOSED)	1574792	15D-2190	P205-10725
12	6	SPRING - ANTI-BOUNCE	1718000	18D-9178	P42 WX-3291
13	6	SPRING - HANDLE LATCH	1589485	25D-3141	P17WX-2489
14	6	CONTACT - MOVING, AUX ARCING	1640215	30A-8874	P17WX-2490
15	12	CONTACT - STAT., AUX. ARCING	1581858	18D-9178	
16	24	SPRING - CALIBRATION	1736397	22-D-8747	
17	6	SPRING - HOLD-IN	1589329	19D-8409	P205-10961
18	6	SPRING - ST. DELAY (O.C.)	1584711	19D-8839	P205-11141
19	6	SPRING - INST. (O.C.)	1611892	19D-8839	
20	6	SPRING - ST. DELAY (O.C.)	1645400	19D-8839	
21	6	SPRING - INST. (O.C.)	1611890	19D-8839	
		* 3 BREAKERS HAD CALIBRATION CHANGED IN			
		OCT. 1950 ON S.O. 32-Y-2589 AS FOLLOWS			
		CURVE 388711B			
		SHORT DELAY PICKUP 1600A			
		SHORT DELAY BAND #1			
		INST. PICKUP 11000A			
<b>CERTIFICATION DATA</b>			<b>WESTINGHOUSE ELECTRIC CORPORATION</b>		
TYPE DBN-405			EAST PITTSBURGH PA. USA.		
AIR CIRCUIT BREAKER			DWG. 33 B 6497		
FEEDER BREAKER			BUSHIPS DWG. NO. REV. B		
			SHEET 2 OF 2		

Fig. 17 - Feeder Circuit Breaker - Certification Data  
 (For SS 576) (Use in Conjunction with Fig. 22)  
 (Dwg. 33-B-6497-3)

35-224-C7

**CERTIFICATION DATA FOR CIRCUIT BREAKERS**

A. MASTER DRAWING S6205-H-3198878 REVISION 0

B. MFR'S DRAWING NO. JH448 REVISION

C. MASTER DRAWING FIGURES APPLICABLE TO CONTRACT 1-3

D. APPLICABLE SPECIFICATION MIL-C-193B OF \_\_\_\_\_

E. NAVY CONTRACT OR SHIPBUILDER'S ORDER NO. NOBS-3599 OF \_\_\_\_\_

F. MFR'S ORDER NO. GO.HR-44957Y S.O. 33-Y-1764

G. CIRCUIT BREAKER TYPE AND FRAME SIZE - NAVY ACB 600 FRAME

MFR'S DBN-405

H. DESCRIPTION OF CIRCUIT BREAKER

VOLTAGE 1000 DC MEANS OF CLOSING MANUAL

NO. OF POLES 2 NO. OF OVERCURRENT COILS 2

CONNECTIONS BACK MOUNTING DEAD FRONT

AUXILIARY SWITCH CIRCUITS \_\_\_\_\_

OVERCURRENT TRIPPING CURVE MFR'S NO. 388712B (FEEDER)

I. COIL RATINGS, PICKUP AND TIME SETTINGS:

1. OVERCURRENT COIL RATING-AMPERES ..... 320

2. LONG-TIME DELAY PICKUP SETTING-AMPERES 500

3. SHORT-TIME DELAY BAND SETTING ..... 1000

4. SHORT-TIME DELAY BAND SETTING ..... #1

5. INSTANTANEOUS PICKUP SETTING ..... 1000

6. SHUNT TRIP COIL RATING-VOLTS ..... NONE

7. CLOSE COIL RATING - VOLTS ..... NONE

8. CLOSING RELAY COIL RATING-VOLTS ..... NONE

9. REVERSE CURRENT TRIP SETTING-AMPERES ..... NONE

10. REVERSE CURRENT POTENTIAL COIL - VOLTS ..... NONE

J. NUMBER OF SHIPS INVOLVED \_\_\_\_\_

K. IDENTIFICATION NUMBERS OF SHIPS 55576

L. NUMBER OF CIRCUIT BREAKERS PER SHIP 3

M. TOTAL NO. OF CIRCUIT BREAKERS INVOLVED 3

N. REPAIR PARTS \_\_\_\_\_ SHEET NO. 2

O. ADDITIONAL DATA, REMARKS, NOTES: \_\_\_\_\_

DRAFTSMAN DATE		CERTIFICATION DATA	
Johnson	3-2-55	TYPE DBN-405	WESTINGHOUSE ELECTRIC CORPORATION
Johnson	3-4-55	AIR CIRCUIT BREAKER	EAST PITTSBURGH PA. USA
CERTIFIED	3-9-55	FEEDER BREAKER	DWG. 33 B 6498 SUB. 3
BUSHIPS APPROVAL LETTER			BUSHIPS DWG. NO. REV.
			BUSHIPS DWG. NO. <u>3</u> REV. <u>B</u>
			SHEET 1 OF 2

**REPAIR PARTS LIST**

NAVY CONTRACT - NOBS-3599  
WESTINGHOUSE G.O. HR-44957Y S.O. 33-Y-1764

ITEM NO.	QUANTITY	NAME OF PART	IDENTIFICATION		
			WESTINGHOUSE STYLE NO.	DRAWING NO.	STANDARD NAVY STOCK NO.
1	6	CONTACT - MOVING, ARCING	1640374	15C558	P17WX-250B
2	6	CONTACT - STATIONARY, ARCING	1766536	2A3598	P17WX-350
3	3	SPRING - ACCELERATION	1491496	9D9360	P205-10804
4	3	SPRING - PAWL	1718591	26D2190	P42WX-3289
5	3	SPRING - ROLLER LATCH	1584498	21D7688	P42WX-3290
6	3	SPRING - RETRIEVE (MECH)	1491448	13D6586	P205-10802
7	3	SPRING - TRIP (MECH)	1491444	13D3193	P205-10801
8	3	SPRING - HANDLE RETURN	1491497	13D3193	P205-10807
9	3	SPRING - WEIGHT (A.S. OPEN)	1404668	9D9236	P205-10808
10	3	SPRING - RESET (A.S. OPEN)	1574793	18D6418	P205-10805
11	3	SPRING - RESET (A.S. CLOSED)	1574792	15D2190	P205-10825
12	3	SPRING - ANTI-BOUNCE	1718000	18D9178	P42WX-3291
13	3	SPRING - HANDLE LATCH	1589485	21D7417	P17WX-2107
14	3	CONTACT - MOVING, AUX. ARCING	1640215	25B3141	P17WX-2489
15	3	CONTACT - STAT., AUX. ARCING	1581858	30A1878	P17WX-2490
16	12	SPRING - CALIBRATION	1736397	18D9178	
17	3	SPRING - HOLD-IN	1589329	22D8747	
18	6	SPRING - ST. DELAY (O.C.)	1584543	19D8409	P205-10960
19	6	SPRING - INST. (O.C.)	1611890	19D8833	

Fig. 18 — Feeder Circuit Breaker — Certification Data  
(For SS 576) (Use in Conjunction with Fig. 22)  
(Dwg. 33-B-6498-3)



35-224-C7

**CERTIFICATION DATA FOR CIRCUIT BREAKERS**

A. MASTER DRAWING S.6205-H-3198878 REVISION 0  
 B. MFR'S DRAWING NO. 1JH448 REVISION \_\_\_\_\_  
 C. MASTER DRAWING FIGURES APPLICABLE TO CONTRACT 1-3-6  
 WIRING DIAGRAM 1JH448, FIG. NOS. 2, B, 2C  
 D. APPLICABLE SPECIFICATION MIL-C-1938 OF \_\_\_\_\_  
 AND AMENDMENTS \_\_\_\_\_  
 E. NAVY CONTRACT OR SHIPBUILDERS ORDER NO. N102S-59375  
 F. MFR'S ORDER NO. G.O. HR-45502Y S.O. 33-Y-1766  
 G. CIRCUIT BREAKER TYPE AND FRAME SIZE - NAVY ACB 600 FRAME  
 MFR'S. DBN-405  
 H. DESCRIPTION OF CIRCUIT BREAKER \_\_\_\_\_  
 VOLTAGE 1000 D.C. MEANS OF CLOSING MANUAL  
 NO. OF POLES 2 NO. OF OVERCURRENT COILS 2  
 CONNECTIONS BACK MOUNTING DEAD FRONT  
 AUXILIARY SWITCH CIRCUITS 4  
 OVERCURRENT TRIPPING CURVE \_\_\_\_\_ MFR'S. NO. 388710-B (BUS-TIE)  
 I. OVERCURRENT COIL RATING - AMPERES \_\_\_\_\_  
 1. OVERCURRENT COIL RATING - AMPERES \_\_\_\_\_ 320  
 2. LONG-TIME DELAY PICKUP SETTING - AMPERES \_\_\_\_\_ NONE  
 3. SHORT TIME DELAY PICKUP SETTING - AMPERES \_\_\_\_\_ 2200  
 4. SHORT TIME DELAY BAND SETTING \_\_\_\_\_ #2  
 5. INSTANTANEOUS PICKUP SETTING \_\_\_\_\_ NONE  
 6. SHUNT TRIP COIL RATING - VOLTS \_\_\_\_\_ 250 (175-355)  
 7. CLOSE COIL RATING - VOLTS \_\_\_\_\_ NONE  
 8. CLOSING RELAY COIL RATING - VOLTS \_\_\_\_\_ NONE  
 9. REVERSE CURRENT TRIP SETTING - AMPERES \_\_\_\_\_ NONE  
 10. REVERSE CURRENT POTENTIAL COIL - VOLTS \_\_\_\_\_ NONE  
 J. NUMBER OF SHIPS INVOLVED \_\_\_\_\_ 55577  
 K. IDENTIFICATION NUMBERS OF SHIPS \_\_\_\_\_ 2  
 L. NUMBER OF CIRCUIT BREAKERS PER SHIP \_\_\_\_\_ 2  
 M. TOTAL NO. OF CIRCUIT BREAKERS INVOLVED \_\_\_\_\_ 2  
 N. REPAIR PARTS \_\_\_\_\_ SHEET NO. 2  
 O. ADDITIONAL DATA, REMARKS, NOTES: \_\_\_\_\_  
 ELECTRIC LOCKOUT 250 V.D.C. (175-355) DE-ENERGIZED TO CLOSE BKR.

DRAFTSMAN DATE		CERTIFICATION DATA	
THOMPSON	3-2-52	TYPE	DBN-405
CHECKER	3-4-52		
CERTIFIED	3-4-52		
BUSHIPS APPROVAL	LETTER		
		WESTINGHOUSE ELECTRIC CORPORATION EAST PITTSBURGH PA. USA	
		DWG. 33 B 652 6 SUB. 4	
		REV. B	

SHEET 1 OF 2

ITEM NO.		NAME OF PART		IDENTIFICATION		STANDARD NAVY STOCK NO.
				WESTINGHOUSE STYLE NO.	DRAWING NO.	
1	12	4	CONTACT - MOVING, ARCING	1640374	15 C 558	P17WX-2508
2	12	4	CONTACT - STATIONARY, ARCING	1766536	21A3598	P17WX-3350
3	4	4	SPRING - ACCELERATION	1491496	9D 9360	P205-1980L
4	3	2	SPRING - PAWL	1718591	26D 2194	P42 WX-3289
5	3	2	SPRING - ROLLER LATCH	1584498	21D7688	P42 WX-3290
6	3	2	SPRING - RETRIEVE (MECH)	1491446	13D 6586	P205-10802
7	3	2	SPRING - TRIP (MECH)	1491444	13D 3193	P205-10801
8	3	2	SPRING - HANDLE RETURN	1491497	13D 3193	P205-10807
9	3	2	SPRING - WEIGHT (A.S. OPEN)	1404668	9D 9236	P205-10808
10	3	2	SPRING - RESET (A.S. OPEN)	1574793	18D 6418	P205-10805
11	3	2	SPRING - RESET (A.S. CLOSED)	1574792	15D 2190	P205-10725
12	3	2	SPRING - ANTI-BOUNCE	1718000	18D 9178	P42 WX-3291
13	3	2	SPRING - HANDLE LATCH	1589485	21D 7417	P17WX-2107
14	12	4	CONTACT - MOVING, AUX. ARCING	1640215	25D 3144	P17WX-2489
15	12	4	CONTACT - STAT., AUX. ARCING	1818988	30A 8876	P17WX-2490
16	16	5	SPRING - CALIBRATION	1736397	18D 9178	
17	1	2	COIL - SHUNT TRIP 250 V.D.C.	1581779	L-484464	P17WX-1984
18	1	2	COIL - ELEC. L.O. 250 V.D.C.	1611630	L-484465	P17WX-2492
19	1	2	SPRING - RESET (SHUNT TRIP)	1491282	17D 1520	P205-10729
20	2	2	AUXILIARY SWITCH	1397643	18A 3635	P17WX-2151
21	1	2	SPRING - ELEC. L.O.	1589382	18D 9178	P17WX-2111
22	2	2	SPRING - ST. DELAY (O.C.)	1584543	19D 8409	P205-10960
23	2	2	SPRING - INST. (O.C.)	1611890	19D 8833	P42 WX-3353
24	2	2	SPRING - INST. (O.C.)	1611892	19D 8833	P205-11141
25	3	3	SPRING - ST. DELAY (O.C.)	1584711	19D 8409	P205-10961
26						
27						
28						
29	2	2	SPRING - HOLD-IN	1589383	22D 8747	
30	2	2	SPRING - CALIBRATION (O.C.)	1574796	19D 8833	
31	3	3	SPRING - ST. DELAY (O.C.)	1645400	19D 8409	

CERTIFICATION DATA

DRAFTSMAN DATE		CERTIFICATION DATA	
THOMPSON	3-2-52	TYPE	DBN-405
CHECKER	3-4-52		
CERTIFIED	3-4-52		
BUSHIPS APPROVAL	LETTER		
		WESTINGHOUSE ELECTRIC CORPORATION EAST PITTSBURGH PA. USA	
		DWG. 33 B 652 6 SUB. 4	
		REV. B	

SHEET 2 OF 2

FIG. 20 — Bus-Tie Circuit Breaker — Certification Data  
 (For SS 577) (Use in Conjunction with FIG. 22)  
 (Dwg. 33-B-6526-4)

# AIR CIRCUIT BREAKER

**CERTIFICATION DATA FOR CIRCUIT BREAKERS**

A. MASTER DRAWING 56205-H-3198878 REVISION D  
 B. MFR'S DRAWING NO. 1 JH.448 REVISION  
 C. MASTER DRAWING FIGURES APPLICABLE TO CONTRACT 1-3-6  
 WIRING DIAGRAM 1 JH.448 FIG. NOS. 2, B, 2C  
 D. APPLICABLE SPECIFICATION MIL-C-1938 OF  
 AND AMENDMENTS  
 E. NAVY CONTRACT OR SHIPBUILDER'S ORDER NO. NOBS-3599  
 F. MFR'S ORDER NO. GO. HR-44957Y S.O. 32-Y-9857  
 G. CIRCUIT BREAKER TYPE AND FRAME SIZE-NAVY ACB 600 FRAME  
 MFR'S. DBN-405  
 H. DESCRIPTION OF CIRCUIT BREAKER  
 VOLTAGE 1000 D.C. MEANS OF CLOSING MANUAL  
 NO. OF POLES 2 NO. OF OVERCURRENT COILS 2  
 CONNECTIONS BACK MOUNTING DEAD FRONT  
 AUXILIARY SWITCH CIRCUITS 4  
 OVERCURRENT TRIPPING CURVE MFR'S. NO. 388710-B (BUS TIE)  
 I. COIL RATINGS, PICKUP AND TIME SETTINGS:  
 1. OVERCURRENT COIL RATING-AMPERES 320  
 2. LONG-TIME DELAY PICKUP SETTING-AMPERES NONE  
 3. SHORT TIME DELAY PICKUP SETTING-AMPERES 2200  
 4. SHORT TIME DELAY BAND SETTING #2  
 5. INSTANTANEOUS PICKUP SETTING NONE  
 6. SHUNT TRIP COIL RATING-VOLTS 250 (175-355)  
 7. CLOSE COIL RATING VOLTS NONE  
 8. CLOSING RELAY COIL RATING-VOLTS NONE  
 9. REVERSE CURRENT TRIP SETTING-AMPERES NONE  
 10. REVERSE CURRENT POTENTIAL COIL-VOLTS NONE  
 J. NUMBER OF SHIPS INVOLVED 1  
 K. IDENTIFICATION NUMBERS OF SHIPS 55576  
 L. NUMBER OF CIRCUIT BREAKERS PER SHIP 2  
 M. TOTAL NO. OF CIRCUIT BREAKERS INVOLVED 2  
 N. REPAIR PARTS --- SHEET NO. 2  
 O. ADDITIONAL DATA, REMARKS, NOTES:  
ELECTRIC LOCKOUT 250 V.D.C. (175-355) DE-ENERGIZED TO CLOSE BKR.

DRAFTSMAN DATE		CERTIFICATION DATA	
THOMPSON 3-5-55	3-4-55	TYPE DBN-405	WESTINGHOUSE ELECTRIC CORPORATION EAST PITTSBURGH PA. USA
3-4-55	3-4-55	AIR CIRCUIT BREAKER	DWG. 33 B 6496 SUB. 4
3-5-55	3-5-55	BUS TIE BREAKER	BUSHIPS DWG. NO. REV. B
BUSHIPS APPROVAL LETTER		SHEET 1 OF 2	

**REPAIR PARTS LIST**

NAVY CONTRACT - NOBS-3599  
 WESTINGHOUSE S.O. HR-44957Y S.O. 32-Y-9857 C.S.O. 33X1764

ITEM NO.	NAME OF PART	IDENTIFICATION		STANDARD NAVY STOCK NO.
		WESTINGHOUSE STYLE NO.	DRAWING NO.	
1	CONTACT-MOVING, ARCING	1640374	15 C 5581	P17WX-2508
2	CONTACT-STATIONARY, ARCING	1766536	21A 3598	P17WX-3350
3	SPRING-ACCELERATION	1491496	9D 9360	P205-10804
4	SPRING-PAWL	1718591	26D 2194	P42WX-3289
5	SPRING-ROLLER LATCH	1584498	21D7688	P42WX-3290
6	SPRING-RETRIEVE (MECH.)	1491448	13D 6586	P205-10802
7	SPRING-TRIP (MECH.)	1491444	13D 3193	P205-10807
8	SPRING-HANDLE RETURN	1491497	13D 3193	P205-10807
9	SPRING-WEIGHT (A.S. OPEN)	1404668	9D 9236	P205-10806
10	SPRING-RESET (A.S. OPEN)	1574793	18D 6418	P205-10805
11	SPRING-RESET (A.S. CLOSED)	1574792	15D 2190	P205-10725
12	SPRING-ANTI-BOUNCE	1718000	18D 9178	P42WX-3291
13	SPRING-HANDLE LATCH	1584485	21D 7417	P17WX-2107
14	CONTACT-MOVING, AUX. ARCING	1640215	25B 3744	P17WX-2489
15	CONTACT-STAT. AUX. ARCING	1581858	30A 8878	P17WX-2490
16	SPRING-CALIBRATION	1736397	18D 9178	
17	COIL-SHUNT TRIP 250 V.D.C.	1981779	L-484464	P17WX-1984
18	COIL-ELEC. L.O. 250 V.D.C.	1611630	L-484465	P17WX-2492
19	SPRING-RESET (SHUNT TRIP)	1491282	17D 1520	P205-10729
20	AUXILIARY SWITCH	1397643	18A 3835	P17WX-2151
21	SPRING-ELEC. L.O.	1589382	18D 9178	P17WX-2111
22	SPRING-ST. DELAY (O.C.)	1584543	19D 8409	P205-10960
23	SPRING-INST. (O.C.)	1611890	19D 8433	P42WX-3353
24	SPRING-INST. (O.C.)	1611892	19D 8433	P205-11141
25	SPRING-ST. DELAY (O.C.)	1584711	19D 8409	P205-10961
26				
27				
28				
29	SPRING-HOLD-IN	1589329	22D 8747	
30	SPRING-CALIBRATION (O.C.)	1574796	19D 8433	
31	SPRING-ST. DELAY (O.C.)	1645400	19D 8409	
32				

WESTINGHOUSE ELECTRIC CORPORATION  
 EAST PITTSBURGH PA. USA  
 DWG. 33 B 6496 SUB. 4  
 BUSHIPS DWG. NO. REV. B  
 SHEET 2 OF 2

FIG. 21 - Bus-Tie Circuit Breaker - Certification Data  
 (For SS 576) (Use in Conjunction with FIG. 22)  
 (Dwg. 33-B-6496-4)

LIST OF MATERIAL QUANTITIES FOR ONE BREAKER									
PG. NO.	NAME	NO. REQ.	MATERIAL	MATL. SPEC.	CONTRACTOR DWG. NO.	MANUFACTURER NAME	BUSHIPS DWG. NO.	STD. NAVY STOCK NO.	REMARKS
1	POLE UNIT & ARC CHUTE						3,109572		MFR. PLAN 56-J-977
2	OVERCURRENT						3,109573		56-J-978
3	AUX. SW. & TERM. BLOCK						3,109569		56-J-974
4									
5									
6	Mechanical Anti-Shock W. Holder in Anti-Shock Unit								
7	BREAKER HOUSING						3,109575		57-J-108
8	ELECTRIC LOCKOUT								1-JH-235
9	PANEL		STEEL	COMMERCIAL	30-A-8870	IT.1			
10	PAD	4	STEEL	46 S 18	30-A-8870	IT.2			
11	SCREW	8	STEEL	42 S 5	30-A-8870	IT.3			
12	PAD	2	STEEL	46 S 18	30-A-8870	IT.4			
13	ANGLE	1	STEEL	COMMERCIAL	30-A-8870	IT.5			
14	CHANNEL	1	STEEL	COMMERCIAL	30-A-8870	IT.6			
15	BAR	1	STEEL	COMMERCIAL	30-A-8870	IT.7			
16	BAR	1	STEEL	COMMERCIAL	30-A-8870	IT.8			
17	BAR	1	STEEL	COMMERCIAL	30-A-8870	IT.9			
18	PAD	1	STEEL	46 S 18	30-A-8870	IT.10			
19	SHELF	1	STEEL	47 S 11	30-A-8874	IT.1			
20	FOOT	1	STEEL	47 S 11	30-A-8874	IT.2			
21	FOOT	1	STEEL	47 S 11	30-A-8874	IT.3			
22	CHANNEL	2	STEEL	47 S 11	30-A-8874	IT.4			
23	TRIP BAR	1	ALUMINUM	47 A 11	22-B-1703	IT.1			
24	TRIP FINGER	1	PHENOLIC	JAN-P-13	13-B-4829	IT.5			
25	INSERT	1	BRASS	47 B 2	29-D-881	S.106719			
26	SPRING	1	PH. BRZ.	46 B 14	18-B-1847	S.1491526			
27	RIVET	1	STEEL	46 S 18	17-D-5896	S.1491527			
28	CROSS BAR	1	STEEL	46 S 18	22-B-1703	IT.10			
29	SNAP RING	2	STEEL	22 W 11 C	5-C-9699	S.1491395			
30	BRACKET	2	STEEL	47 S 11	30-A-8874	IT.1			
31	BRACKET	2	STEEL	47 S 11	30-A-8874	IT.2			
32	NUT	4	STEEL	COMMERCIAL	29-D-432	S.1063584			
33	ARM	4	STEEL	COMMERCIAL	30-A-7969	IT.3			
34	ARM	4	STEEL	COMMERCIAL	30-A-7969	IT.6			
35	PLATE	4	STEEL	46 S 6	30-A-7969	IT.4			
36	PLATE	2	PHENOLIC	JAN-P-13	30-A-7961	IT.8			
37	HANDLE	1	ALUM. CSTG.	40-A-581	22-B-7977	IT.2			
38	SCREW	1	STEEL	46 S 5	26-D-1779	IT.1			
39	NAMEPLATE 57166	1	MONEL	42 N 2	30-A-8881	IT.19			
40	SCREW	2	STEEL	42 S 5	30-A-8881	IT.20			
41	CHANNEL	1	STEEL	47 S 11	30-A-8874	IT.5			
42	BOLT	4	STEEL	43 B 11	30-A-8881	IT.27			
43	LOCKWASHER	4	STEEL	43 W 1	30-A-8881	IT.28			
44	WASHER	4	STEEL	43 W 1	30-A-8881	IT.29			
45	NUT	12	STEEL	43 B 11	30-A-8881	IT.30			
46	LOCKWASHER	16	STEEL	43 W 1	30-A-8881	IT.31			
47	BOLT	2	STEEL	43 B 11	30-A-8881	IT.32			
48	BOLT	2	STEEL	43 B 11	17-D-5896	S.1539368			
49	PAD	4	STEEL	46 S 18	30-A-8870	IT.11			
50	BOLT	6	STEEL	43 B 11	30-A-8881	IT.37			
51	BOLT	2	STEEL	43 B 11	30-A-8881	IT.39			
52	BOLT	4	STEEL	43 B 11	30-A-8881	IT.40			
53	SCREW	2	STEEL	42 S 5	30-A-8881	IT.41			
54	INSULATION	1	PHENOLIC	JAN-P-13	30-A-8875	IT.10			
55	PLATE	1	PHENOLIC	JAN-P-13	30-A-8882	IT.1			
56	BAR	1	PHENOLIC	JAN-P-13	30-A-8882	IT.2			
57	SCREW	2	STEEL	42 S 5	22-B-1631	IT.12			
58	BRACKET	1	STEEL	47 S 11	30-A-8882	IT.3			
59	BOLT	3	STEEL	43 B 11	30-A-8882	IT.4			
60	LOCKWASHER	3	STEEL	43 W 1	30-A-8882	IT.5			
61	WASHER	4	STEEL	43 W 1	30-A-8881	IT.44			
62	LOCKWASHER	16	STEEL	43 W 1	30-A-8881	IT.38			
63	NUT	8	STEEL	43 B 11	30-A-8881	IT.21			
64	NUT	2	STEEL	43 B 11	30-A-8881	IT.36			
65	SCREW	2	SI. BRZ.	46 B 27	4-C-5200	S.1533840			
66	NUT	2	BRASS	43 B 11	22-B-1703	IT.5			
67	LOCKWASHER	2	STEEL	43 W 1	22-B-1703	IT.6			
68	WASHER	2	STEEL	43 W 1	22-B-1703	IT.7			
69	RIVET	2	STEEL	46 S 18	21-D-7443	S.181693			
70	NUT	2	STEEL	43 B 11	5-D-3018	S.1820480			
71	CONTROL VOLTAGE NAMEPLATE	1	MONEL	42 N 2	30-A-8881	IT.47			
* 72	SPRING - TRIP (MECH)	1	STEEL	22 W 11 C	19-D-3193	S.1491444			P20-5-10801
* 73	SPRING - HANDLE RETURN	1	STEEL	22 W 11 C	19-D-3193	S.1491497			P20-5-10807
* 74	SPRING - ROLLER LATCH	1	STEEL	22 W 11 C	19-D-3193	S.1521118			P42-WX-3290
* 75	SPRING - RETRIEVE (MECH)	1	STEEL	22 W 11 C	19-D-6556	S.1491448			P20-5-10302
* 76	SPRING - PAWL	1	STEEL	22 W 11 C	26-D-2190	S.1718591			P42-WX-3289
* 77	SPRING - A.V. ELEVATION	2	STEEL	22 W 11 C	9-D-9360	S.1491496			P20-5-10804
* 78	SPRING - RESET (A.S. CLOSE)	1	STEEL	22 W 11 C	19-D-2190	S.1674792			P20-5-10725
* 79	SPRING - RESET (A.S. OPEN)	1	STEEL	22 W 11 C	18-D-6416	S.1574793			P20-5-10805
* 80	SPRING - WEIGHT (A.S. OPEN)	1	STAINLESS STEEL	A316-47	9-D-9236	S.1404660			P20-5-10806

REVISIONS			
REV. NO.	DESCRIPTION	DATE	BY

DESCRIPTIVE DATA	
MFR.	WESTINGHOUSE ELEC. CORP.
TYPE	NAVY ACB MFR. DBN-405
VOLTAGE RATING	1000 V.D.C.
KIND OF CURRENT	D.C.
FRAME SIZE	600
CONTINUOUS CURRENT RATING (COPPER)	640 AMPS
CONTINUOUS CURRENT RATING (TRIP COIL)	20-35-100-180-250-300-400-500-550-600
INTERRUPTING RATING	40000 AMPS.D.C.
NO. OF POLES	2 POLE
TYPE OF MOUNTING	STATIONARY-DEAD FRONT
CONNECTION	BACK
SHOCK RESISTANCE	CLASS HI
MEANS OF CLOSING	MANUAL
PROTECTIVE FUNCTIONS	OVERCURRENT LONG TIME DELAY SHORT TIME DELAY INSTANTANEOUS
ATTACHMENTS	SHUNT TRIP AUXILIARY SWITCH ELECTRIC LOCKOUT
AMBIENT TEMPERATURE	50°C
HOUSING ASSEM. MASTER PLAN NO. 57-J-108	BUSHIPS NO. 3,109575
NAVY DEPT. SPEC.	MIL-C-1938
EXCEPTIONS TO SPEC. MIL-C-1938	SEE CERT. DATA SHEET
WEIGHT OF BASIC BREAKERS	2 POLE - 2 TRIP COIL 195 LBS.
WEIGHT OF ATTACHMENTS	SHUNT TRIP 1 1/2 LBS. AUXILIARY SWITCH 3/4 LBS.
	ENCLOSURE - FIG 5 77 LBS. ELECTRIC LOCKOUT 9 LBS.

LIST OF MATERIAL QUANTITIES ARE FOR ONE BREAKER									
NO. REQ.	MATERIAL	MATL. SPEC.	CONTRACTOR DWG. NO.	MANUFACTURER NAME	BUSHIPS DWG. NO.	STD. NAVY STOCK NO.	REMARKS		
1	STEEL	22 W 11 C	17-D-1820	S.1491282		P20-5-10729			
1	STEEL	22 W 11 C	22-D-8747	S.1509329					
2	STEEL	22 W 11 C	19-D-8839	S.1574796		P20-5-10732			
2	STEEL	22 W 11 C							
1	STEEL	22 W 11 C	18-D-9178	S.1718090		P42-WX-3291			
1	STEEL	22 W 11 C	18-D-9178	S.1589382		P17-WX-2111			
1	NOTE 3		1-JH-235	S.1611630		P17-WX-2492			
1	NOTE 4		56-J-974	S.1397643		P17-WX-2151			
1	BRASS	46 S 6	7-C-6669	S.1718592					
1	NOTE 1		56-J-974	S.1521779		P17-WX-1984			
2	NOTE 2		56-J-977	S.1640374		P17-WX-2508			
2	NOTE 2		56-J-977	S.1746584		P17-WX-3350			
2	NOTE 2		56-J-977	S.1640265		P17-WX-2489			
2	NOTE 2		56-J-977	S.1581858		P17-WX-2490			
1	STEEL	47 S 11	21-D-7417	S.1585485		P17-WX-2107			
1	STEEL	COMMERCIAL	22-D-913	IT.5					

MFR. PLAN NO. 56-J-976  
 \* 56-J-977  
 \* 1-JH-235  
 \* 56-J-974

DATE	BY	SCALE	UNIT WT. SEE ABOVE	CONT. ON SH. SHT. NO.

Fig. 22 - Bus-Tie or Feeder Air Circuit Breakers - Master Plan and Details (For Certification Data See Figs. 14 to 21 Inclusive) (Dwg. 1-JH-448-7)

